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PRESIDING:
Dr. Edward H. Trowbridge, Worcester, Chairman.
Dr. Charles W. Blackett, Jr., Newtonville, Secretary.

CHAIRMAN TROWBRIDGE: In opening this Section, the Chairman feels it is his duty to express to the speakers of the morning, especially those who will discuss the papers, his sincere thanks and due appreciation of the willingness and hearty coöperation manifested by those who are to take part in the program. As the program this morning is on a scientific basis, it should appeal to every member of the Massachusetts Medical Society whether or not the subjects may be in his special line, and as a matter of general information.

The first paper of this morning, as announced in the program, will be on the subject of "Fever Therapy and Other Recent Developments in Physical Therapy", and I wish to state that it gives me great personal gratification to present to you the speaker on that topic, and I assure you by reason of personal relations with him that it is a great pleasure to introduce Dr. William H. Schmidt, of Philadelphia.

FEVER THERAPY AND OTHER RECENT DEVELOPMENTS IN PHYSICAL THERAPY*

BY WILLIAM H. SCHMIDT, M.D.†

FOR one who has been interested in the practice of physical therapy for many years, the gradual evolution of this art is not only interesting, but a source of great pride and satisfaction. From the days of empiricism, we have advanced to the stage of a well-recognized branch of medicine, which is now receiving due recognition from the official bodies of organized medicine, and institutions of learning.

The practitioner of physical therapy, today, is far different from his brother of other years, when the use of some simple forms of electrical currents, producing mainly a psychic effect, constituted his full armamentarium. Unfortunately, some of our less progressive brethren still harbor the same idea, but only because they are not aware of the progress which has been made during recent years.

Today, the specialist in physical therapy must be a competent and scientific man, in order to warrant his standing in the profession. First of all, he must be a physician, able to study scientifically and diagnose correctly his patient's case, and utilize judgment in the application of treatment. He must understand the modalities he employs, and the physiological effects which they produce. He must have a good knowledge of anatomy, especially of the muscles, bones, joints and nerves, and be well versed in the knowledge of body mechanics. Lastly, he must have an analytical mind, ever on the alert to discover the scientific truths of the effects he produces.

The development of this new type of physical therapist has resulted in the coöperation of that portion of the profession which is progressive, and recognizes the value of work well done. Leading surgeons and specialists in every line are now seeking the benefits to be derived from physical therapy, and this has resulted in the many great and important advances which have been made during recent years.

The surgeon now knows the value of these methods in the present-day treatment of fractures, dislocations and other industrial accidents, and employs them immediately, sometimes even before the fracture is set. Early mobilization and the use of removable splints, as practiced by Dr. C. R. Murray at the Medical Center, in New York, have shown a marked lessening of the time of treatment and improved functional results. The work of Dr. Phillip D. Wilson of Boston[1] and that of Dr. Harry Mock of Chicago[2] are outstanding examples of the scientific employment of physical therapy in traumatic surgery.

This interest by the leaders of the profession is the most important step made by physical

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therapy and much of our future knowledge and improvements in its use will come from this coöperation of the physical therapist with those well-versed in the various specialties of medicine, especially in our large teaching institutions where investigation can be pursued. Most of the recent advances have emanated from men, not primarily identified with physical therapy, but who have realized the limitations of their own methods and have developed improvements by physical measures.

The use of artificially induced fever represents a great advance in the medical use of physical therapy. This resulted directly from the use of malaria in the treatment of paresis by von Jauregg[3]. Because of the dangers and disadvantages of malaria due to its lack of control, as to the length and duration of the fever, means were sought to produce artificial fever which could be controlled. It was known that heat could be produced in the body by diathermy and a method was worked out by Neymann and Osborne[4] whereby this heat could be retained simply by wrapping the patient in blankets. A rapid rise of temperature resulted, which was controllable both as to height and duration and which was always available. This has proved a reliable and satisfactory method and it is much used at present.

A later development was the use of the radiotherm, which depends for its action on the use of short-wave radio broadcasting tubes, developed in the General Electric Laboratories by Carpenter, Page and Boak[5, 6]. This has also proved a satisfactory method and many of the technical difficulties have been corrected so that the treatment is now being used successfully in many large institutions. Hinsie and Blalock[7] have reported a series of cases of paresis, heated by the radiotherm and compared with a similar series treated by malaria. Their results were practically the same by both methods and they conclude that "heat is, at least, an important factor in securing the results."

Recently, we have been using another method of producing fever. This apparatus is called the Hyperpyrexator and consists of a cabinet heated by an infra-red element, with means provided for humidizing the air. The patient reclines on a couch, nude, and there are no electrical contacts. The arms and legs can be freely moved, and the head being outside the cabinet, the patient is much more comfortable. We have been able to raise the temperature to 105 degrees within an hour with safety and comparative comfort to the patient. We prefer this method because it is safe, less difficult, and more comfortable for the patient.

Many new forms of apparatus are being developed. All aim at increasing the patient's comfort and safety, and no doubt, the future will show marked improvement in this respect. Already some of these new methods are being tried out in actual work.

Elevation of body temperature means elevation of the temperature of the blood stream, and it would seem that the results should be the same regardless of the method used. Any local concentration of heat is quickly equalized and nature tends to distribute it throughout the whole body. Therefore, that method which will elevate temperature safely and with the least discomfort to the patient will be preferred.

The technique varies with the method used but the object is to elevate the body temperature to the desired degree as quickly and safely as possible. Temperatures of 100° and 105° are used, but seldom above the latter degree. Whether the temperature will have to be sustained for any prolonged period still remains to be proved. Some workers have sustained the temperature at 105 degrees for several hours, but our procedure has been to keep the patient well-wrapped in blankets and to allow the temperature gradually to fall to normal in three or four hours. We give the treatment five days a week for a series of ten treatments. We then allow the patient to rest for a month or two and if there has been any improvement we will then repeat the series.

Great care must be exercised in selecting the patients, as the treatment is rather strenuous and there is danger of fatalities. Advanced degeneration of the heart, kidneys or nervous system is a contraindication. Patients over 50 years of age are treated only when in perfect physical condition.

The type of case that is amenable is that in which nature does not react to produce fever. Here, it is believed, we simulate nature's attempt at cure by stimulating the body resistance and the development of immune products. There are many infections which do not produce a fever reaction, and are not self-limiting. Some of these are well-known, while others have not as yet been proved to be infections, but offer a large field for further investigation of the value of artificial fever.

At the Jefferson Hospital, we have treated a number of cases of multiple sclerosis[8] with some rather surprising results. We have found that those patients who have had remissions respond best, and that the earlier the treatment the better the results have been. Old chronic cases do not respond and advanced age of the patient warrants a poor prognosis. We have had a number of patients who have had complete remissions and others showing marked improvement. Sufficient time has not elapsed to enable us to call them cures, but many who have developed remissions, have not had a recurrence for as long as two years.

In paresis, a number of men have reported results equaling those resulting from the induction of malaria[9, 10, 11, 12, 13]. In most instances, the temperature elevation has been sustained

for several hours. We have had an opportunity to treat only a few cases, but our results, without attempting to maintain the temperature for a long period, have been equally good. We have seen complete restoration of mental and physical health in these cases, some of which gave little hope of improvement when the treatment started.

We have also treated a number of cases of postencephalitis, showing the Parkinsonian syndrome, with marked improvement in quite a few. We also had a very interesting experience with one case of optic atrophy of the Leber type. This was a boy 19 years old, complaining of impaired vision for over a year, referred by Dr. Frank Murphy, chief ophthalmologist to St. Mary's Hospital, Philadelphia. Before treatment, vision was O.D. fingers at three feet. O.S. fingers at one foot. A large central, absolute scotoma in each eye. After several series of treatments, vision is now 6/6 in each eye. The central scotoma is relative in character and noted by patient only as a slight central haze. He can read a newspaper without difficulty at the present time.

Tabes dorsalis has also been treated with favorable results. Of course, it must be realized that you cannot replace nerve fibers that have been destroyed. The observations of Menninger and Fellows[11] and others warrant further investigation of this disease.

Asthma and other allergic diseases have been treated by this method with a measure of success by Fineberg, Osborne and Afremow[14, 15], Leopold and Stewart[16] and Miller and Piness[17]. Our personal experience has been limited, but I believe it is simply a matter of developing a correct technique, which will probably have to be modified to suit the individual patient and type of case.

A very great interest has been developed in the use of this method in the treatment of arthritis. This condition covers such a multitude of diseases, from so many different causes, that it will probably have to be treated by a varying technique, depending on the classification of the disease and its cause. There are sufficient data available to warrant a thorough investigation of this subject. Markson and Osborne[18] have reported on the use of fever in this condition with favorable results, and no doubt, forthcoming reports will add much to our knowledge of how best to employ fever in the treatment of this now prevalent and disabling disease.

It can readily be seen that a vast, new field of therapy has been opened and definitely proved in a number of diseases. The field for future investigation is unlimited and I predict that in the near future, it will prove to be the treatment of choice, when the technique will have been correctly developed, in many conditions which today possess no adequate therapy.

Another recent development in physical therapy is the use of histamine by cataphoresis in rheumatic conditions, muscular and nerve pains and all kinds of organic circulatory diseases. All external remedies having an anti-rheumatic effect produce redness of the skin with dilatation of the superficial capillaries, probably due to the formation of histamine. When histamine is applied cataphorically to the skin, there develops a dilatation of the superficial capillaries and of the larger, deeper-lying vessels, and an increased permeability of the vessel walls.

Deutsch[19] reported a series of 250 cases including myalgias, sprains, sciatica, arthralgias, etc., with a large number of cures. Only those conditions associated with a localized sensitivity to pressure or inhibition to movement responded. Prompt relief was frequent and permanent results required from four to 20 treatments.

Trumpp[20] reported a good percentage of results in muscular pains. Vas[21] reported results in all kinds of circulatory diseases, including gangrene, furunculosis and inadvertent paravenous injections of medicaments. Bettmann[22] recommends it for all circulatory disturbances whether functional or organic. He reports amazingly rapid healing in furunculosis, Raynaud's diseases and ulcers of the extremities. He considers it a specific for all acute myalgias and many cases of neuritis.

The application is made over the sensitive areas under the positive pole of the galvanic current by means of blotting paper, saturated with 1-1000 histamine solution. A current of five to ten ma. is used for one minute. A distinct redness results with the formation of a wheal. Another method for use in extremities is the partial bath with the histamine solution of 1-20000 strength for a period of ten minutes. Many cases have proved amenable to this therapy, especially organic circulatory diseases such as Raynaud's disease, early gangrene and trophic ulcer, etc.

Much progress is being made in the development of a better understanding of light therapy. High pressure salesmanship has resulted in loading up the physician with all kinds of lamps, about which he understands little. The wave lengths emitted by the light are the all-important factors and differ with the source from which they are produced. Much investigation of the physiological effects of the various wave lengths has been made and we are now in a better position to produce definite physiological effects as they are indicated. No doubt the future will develop means, such as filters, whereby we can separate the various bands and give a definite scientific dose to produce a definite physiological effect.

At the present time there have been developed

the so-called "cold quartz ultra-violet rays" which appear to have certain effects and advantages. This lamp is practically devoid of heat and the rays are produced in a narrow quartz tube, containing mercury vapor, through which a high voltage discharge is passed, causing illumination. There are two types: one, the so-called grid type, which consists of a coil of quartz tubing, winding back and forth across the face of a reflector, which is used to irradiate large surfaces, the other the orificial type for use in the various body cavities. This has the advantage of having the rays given off from the sides as well as from the ends, whereas the Kromayer is active only at the end.

The emission of this light is greatest at 2540 A. and is most effective for its germicidal effects. It is not associated with pigmentation of the skin and is believed to have a destructive effect on vitamin D. There are numerous reports on results following the use of this light in conditions due to infection; and the ability to radiate the cavities of the body from all directions should prove a very valuable addition to our armamentarium. Too little is known at present to make any definite statements as to the proper place of this form of light, but there is promise that it will fill a valuable need in therapy.

Progress is certainly being made in every department of physical therapy and it is gradually emerging into a scientific branch of the healing art. The interest displayed by the profession is growing, particularly among men of scientific attainment, from whom we can expect much in the way of definite explanation of the physiological effects produced. When the indications and limitations of physical therapy are thoroughly understood, there can be no question, but that it is a great advance in dealing with disease which is destined to go on to greater heights of value and usefulness, as the profession gradually learns the fundamental principles underlying its uses.

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DISCUSSION

CHAIRMAN TROWBRIDGE: To open the discussion of this paper it affords me great pleasure to introduce Dr. William D. McFee of Haverhill and Boston.

DR. WILLIAM D. MCFEE: *Mr. Chairman*—Doctor Schmidt, in opening, referred to the progress made in the use of physical therapy and also to the fact that it is now taught in many of our leading medical schools. Medical literature of today contains many and frequent references to physical therapy. This is in marked contrast to the pre-war days, when we found very little in our literature, except in those journals which were particularly concerned in reporting this work.

The physician of the present day who closely observes the responses of the tissues of his patient to the agencies applied to them is probably more convinced of the regenerative capacity of the more highly organized human tissues. One striking example is found in the treatment of conditions due to cerebral hemorrhage by the application of diathermy and galvanism through the brain. When proper care is exercised in reference to current dosage, there is no danger. It has the effect of hastening the return of lost motion in the paralyzed side and has done much to control and counteract the tendency to extreme depression found in these cases. The patient feels more encouraged and is better able to comprehend and to coördinate. This combined treatment, that is, treatment by the combination of diathermy and galvanism, is also very helpful in many of the spinal cord affections.

In all use of electrical currents, it is well to remember that the current employed should be properly controlled and measured. When applying high frequency currents for purposes of surgery, it is necessary to understand the changes produced by currents of varying intensities and to be careful not to over-destroy.

One of the most impressive and beneficial activities of this modern therapy is the effect of inducing hyperemia in the treatment of localized infection by stimulating nature's natural impulse in increasing locally the activity of the phagocytes, by which means the infected or impaired area is rapidly engorged with blood for the purpose of repair and to wall in the localized infection. By thus promoting a better circulation of fresh blood in the injured tissue, we will many times check its further unfavorable progress. This may be accomplished by the use of high frequency currents, radiant heat or the static current, particularly the static brush discharge. The effects of radium and radio-active substances, both sterilizing and destructive of germ life, have been well demonstrated.

I have been privileged to make a somewhat limited observation in regard to the technique of inducing hyperpyrexia. While in Philadelphia last year I visited the clinic of Doctor Schmidt at the Jefferson Hospital and saw the methods of inducing high fever with the apparatus and technique he has just described. I was particularly impressed with the care and thoroughness exercised. Changes occurring during treatment were definitely charted, and complete records of every case were kept.

More recently, I have observed a somewhat different technique followed at one of our Boston institutions. Diathermy was the agency used. The electrodes were applied, one (cuff electrode) encircling each upper arm. Two more were applied, one around each thigh. These were connected in series to one terminal of the high frequency apparatus. Another electrode surrounded the abdomen, above the navel. This was connected to the other terminal of the high frequency outfit. The amount of current used during the treatment varied from 2500 to 3000 milliamperes. The patient was inclosed in a specially constructed cabinet in which there was a window for observation and an opening through which a urine receptacle could be passed to the patient. Inside of the cabinet there were several 60 watt incandescent lights. The patient reclined on a mattress covered with an ordinary sheet; no body covering was used. The head, of course, was entirely outside of the cabinet. Water was administered frequently during the treatment and the patient conversed freely expressing no discomfort other than that of feeling unusually warm. He stated that he appreciated being able to move his hands and feet at will.

The measuring device recorded a gradual rise in temperature during the period of one hour while reaching the desired maximum, in this case, 104.8° rectal temperature. When the current was shut off at the close of the treatment, there was a slight immediate drop followed by a slight rise in temperature. There was copious perspiration all during the treatment. Following this, the cabinet was removed and the patient wrapped in a blanket. The temperature gradually fell to normal. If it is desired to maintain the temperature over any period of time, the cabinet is kept in place with the lights turned on but with the diathermy turned off.

The patient told me that within a few hours of the last treatment, which he had had some few weeks previously, he went out and played baseball with no uncomfortable after-effects.

No fatalities have occurred with this technique which has been used daily for about one year.

In reviewing the literature on this subject I was interested in a report on hyperpyrexia by Dr. A. J. D. Cameron of the Sherwood Park Clinic, published in the August, 1932 issue of the *British Journal of Physical Medicine*.

The technique described is the use of the diathermic current passed to the patient through water baths (Schnee type) in contact with hands and feet. The patient is placed in a cabinet in which there was installed a series of incandescent lamps. Freedom from danger of burning was stressed as one of the advantages of this method. Another fact noted was that during this treatment the patient develops a condition of alkalinosis.

I was interested in the reference of Doctor Schmidt to the use of histamine cataphoresis. Some two years ago this was called to my attention by one of our Boston orthopedic men, who asked if I would make cataphoric use of this substance in certain of the arthritic cases and report the results. Our experience has not been very encouraging. I feel that it is probable that changes which are produced, such as hyperemia in the use of histamine cataphoresis, are more likely due to the galvanism itself. We know that the positive pole of the galvanic current will produce quite an active hyperemia, and I doubt if we are getting any real added benefit from histamine. Recent German medical literature contains extensive reports of the use of histamine.

Light therapy mentioned by Doctor Schmidt is, of course, very valuable. Its use covers such an extensive field that detailed discussion is not here possible, because of the limited time at our disposal. Briefly, it has been of particular value in the treatment of many tuberculous and other atonic conditions. There is still much that is unknown concerning the real action and definite effects of radiant energy on the human organism. In spite of this, there exists an unwarranted tendency among the medical profession and some of the laity to advocate what would

seem to be a careless, even if not dangerous, use of light as a "health builder" and for many diseases. Knowledge of the biological effects of radiant energy and its clinical application is essential to the physician.

I congratulate Doctor Schmidt on presenting to us this very valuable and instructive paper which should stimulate further thought and investigation on the part of all who are interested in progressive medicine.

DR. C. T. PERKINS, Worcester: *Mr. Chairman*—It is a pleasure to be invited to discuss Doctor Schmidt's paper as an act of reciprocity, perhaps, for his participation in the discussion of a paper which I presented in New York a short time ago. I should not enter the discussion, however, because I find it is very difficult, not only difficult, but dangerous, to listen to a scientific paper and attempt to discuss such a paper extemporaneously, and I shall therefore confine my remarks to certain points brought out in the paper, some of which Doctor McFee has already covered very adequately.

I think through the entire paper which Doctor Schmidt presented you will note the need of coördination. The doctor just cannot do all that there is to be done in physical therapy. He cannot know it all, just as the doctor in one institution or in one clinic cannot possibly do all of the work that is to be done. It needs coördination of doctors in many clinics, of the physicians not only specializing in internal medicine, not only men who are interested primarily in physical therapy, but also the surgeons, the roentgenologists, the metabolists and men in the closely associated fields. Even the botanist has much to give us regarding physical therapy and its possible implications in treating human beings.

While I was sitting here listening to Doctor Schmidt's paper and to Doctor McFee's discussion, I wondered why so many doctors use physical therapy for a short period of time and then are prone to discard it and say it is of no value, that they have no use for physical therapy. I think that the reason for that is, as Doctor Schmidt has indicated, that perhaps there has been some high pressure salesmanship brought to bear on the doctor, and he has invested a certain amount of money in machinery out of which he does not get any return. I believe that the doctor is blameworthy. He must have a fairly good background in physics. Physics is to physical therapy what materia medica is to internal medicine, and without that conception I think that the physician who puts his money into equipment is just throwing it away, and he has no one to blame but himself for his failures.

I should like to emphasize one point which Doctor Schmidt brought out, and that is the controllability of producing fevers by diathermy. Doctor Schmidt did not give you any figures, but I should like to quote figures which I gathered during the latter part of April or the first of May this year, that, out of approximately 3,000 elevations of temperature to 105° Fahrenheit rectal, there were only 20 that were not controllable within 0.4° Fahrenheit. That is, as you can see, less than one per cent uncontrollable within 0.4° Fahrenheit.

Fever cannot be controlled by having the physician go to the technician and say, "Give this patient a treatment up to a certain temperature", and then leave the technician. It must be controlled by the constant alertness of the physician who is interested in the treatment. No matter how much or how little we do with fever therapy, I think it needs constant attention of a physician, and that attention and that responsibility cannot be delegated to the technician.

I would like to ask Doctor Schmidt a question regarding hyperpyrexia in which he uses infrared rays and that is whether there has been evidence of heat exhaustion. My impression has been that heat exhaustion could be expected far more frequently from heat produced by infrared rays than from internal heat produced by the resistance of tissues to the electric current, such as in diathermy and radiothermy.

Our experience in multiple sclerosis has extended only a short time, but in general it has been very happy as Doctor Schmidt's has been with his cases in Philadelphia. We have run through only about 15 cases of multiple sclerosis and they have recovered sensation in the limbs. Some have been able to return to full-time work, one to teaching in a responsible position in public schools. The particular thing that is noticeable is that the weaving gait that is characteristic of multiple sclerosis disappears, temporarily to be true, but it can be kept fairly well under control by the fever treatment. I offer no explanation for that. It is merely an observation.

In tabes we have not had the encouraging results which Doctor Schmidt reported. We have had only a few cases. The bulk of our work has been with paresis and syphilis of the central nervous system in general, but we have had only six or eight cases of tabes, and I cannot honestly feel that we have given any improvement to those particular patients.

There is one further point I should like to mention. There has been some discussion in the literature regarding the elevation of the temperature of the spinal fluid by raising the body temperature. Some have felt that the spinal fluid temperature has been raised with no ill effect, to a point of killing the syphilitic spirochetes. Others have commented that, with the raising of the spinal fluid temperature, the temperature has gone so high it has been very detrimental to the patient. In a comparatively new technique we are now using, the patient

lies comfortably in bed while the treatment is going on, perhaps looks at pictures, and at the same time, while his rectal temperature is being taken, by the usual resistance thermometer, a thermo-couple is placed in the spinal canal, and we follow the spinal fluid temperature along with the rectal temperature. I offer no conclusions as to comparisions at the present time, merely submitting the technique.

In conclusion, I think we should thank Doctor Schmidt for his presentation and place upon it our stamp of hearty and general approval.

CHAIRMAN TROWBRIDGE: This subject is now open for a brief discussion from any of those present. If there is no one who wishes to discuss the paper, I will announce at this time the members of the Nominating Committee, who will report, after the reading of the second paper, the officers for the ensuing year. The Chair will appoint as that committee Doctor Arthur Ring of Arlington, Doctor Carr of Lynn, and Doctor Bragg of Webster.

I will now ask Doctor Schmidt if he has anything to offer in conclusion.

DOCTOR SCHMIDT: *Mr. Chairman*—I want to thank the men who have discussed the paper. There is not very much to add in conclusion. The subject is such a large one and there are so many things concerned that we cannot establish any definite facts here this morning. What I did want to bring out, and what was mentioned by Doctor Perkins, is that the physical therapist should seek the coöperation of other men working in different lines, in order to get the greatest success and the greatest benefits out of physical therapy, because that is the only way we can hope to obtain success.

Unfortunately, in the past, the statements of the physical therapist have not always been given a great deal of credit, and I have always felt in all of my work that if I could possibly combine my work with that of a clinician and let the clinician make the diagnosis and evaluate the results, there could be no question about any possible over-enthusiasm on the part of the physical therapist. That is a sort of protection, and I think it is something that we all should do because it is a very valuable way to follow out this work.

Doctor McFee did mention something about surgical uses in physical therapy. I did not touch on that because that in itself is a subject that requires considerable time; but I do feel that the destructive currents which we use in surgery are in a class by themselves. We have cases of carcinoma of certain types reported as treated by radium and x-ray. I think there are many cases where it is the proper form of treatment, but there are certain cases, particularly those of the basal cell type which require destructive treatment. Radium and x-ray will sometimes do it, but it requires a very large dose, it is rather uncertain, and it has quite a devitalizing effect on surrounding tissue. The use of radium and x-ray on large or small basal cell epitheliomas is really a waste of time and money because you can do it more absolutely, certainly and thoroughly with the high frequency current, than you can by the use of radium and x-ray. Furthermore, it is a method which is available to a great many men, whereas radium and x-ray are not, because they require a very much greater knowledge of technique than is necessary in the use of the high frequency current. Therefore I think it is of very much more service to the average general practitioner and surgeon.

CHAIRMAN TROWBRIDGE: In presenting the next speaker, may I say that the secretary of this section was pleased to solicit the attendance of Doctor Pendergrass this morning. I therefore, take pleasure in presenting Dr. Eugene P. Pendergrass, of Philadelphia, who will talk on Pneumoconiosis.

PNEUMOCONIOSIS: THE IMPORTANCE OF ACCURACY IN ROENTGENOLOGICAL INTERPRETATION*

BY HENRY K. PANCOAST, M.D.,† AND EUGENE P. PENDERGRASS, M.D.†

IT is generally conceded that the roentgenographic examination, when properly carried out, is the most accurate means at our command of determining the exact condition of the lungs in any case of suspected pneumoconiosis, or of differentiating this condition and any other one which may be present. For many years pneumoconiosis has been regarded very largely in the light of an interesting condition and often presents rather spectacular roentgenographic appearances. The extreme importance of roentgenograms as a means of diagnosis and of the accuracy of their interpretation in indicating the exact pathological condition present in connection with pneumoconiosis has received unusual emphasis of late in court proceedings and before compensation boards. It is unfortunate that the old impression of an interesting condition and the spectacular element still seem to exert a benumbing effect upon the desire for

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the attainment of the greatest possible accuracy in interpretation by the proper attention to the various factors essential in its achievement.

The ability to interpret roentgenograms of cases of pneumoconiosis properly must be based upon several very important factors which may be enumerated as follows: (1) a knowledge of the anatomy of the chest and many of the physiological problems associated with its anatomical constituents; (2) thorough familiarity with normal roentgenographic and fluoroscopic appearances and permissible variations therefrom within normal limits; (3) a knowledge of the histology of the lungs and especially of the lymphatic system; (4) a clear perception of the pathology of the condition of pneumoconiosis and of all conditions which may simulate it in roentgenographic appearances; (5) an experienced intimacy with the roentgenographic appearances of the condition in question and of those which may bear a resemblance to it, based upon a fundamental knowledge of the pathology represented; (6) a knowledge of the physical factors involved in the production of the suspected or alleged pneumoconiosis and, (7) the employment of the proper technic to show to full advantage any or all of the abnormalities present, for technic may fully enlighten, may so modify appearances as to be confusing or may be quite misleading. These facts in regard to technic have been fully demonstrated in important cases quite recently.

A desire to learn more about the degrees of normal variations in lung markings was the primary object of one of us in conjunction with others in taking up the study of pneumoconiosis seventeen or eighteen years ago[1, 2, 3]. The primary urge of fascination later gave way to the true realization of the important part that the roentgenological aspect of the condition was likely to play in the future. A request by one of the Roentgen Societies of this country to bring the entire subject before the body of roentgenologists[4, 5] required a deeper insight into all phases of the condition. It has been fortunate that the National Tuberculosis Association desired to have an investigation by a committee to attempt to designate the roentgenographic appearances of the chest of the healthy individual[6]. It is of the utmost importance to know normal appearances in order to interpret the earlier changes which take place in pneumoconiosis.

In studying the roentgenograms or in making fluoroscopic observations of a chest one should take cognizance of every anatomical structure. Otherwise some important abnormality is bound to escape notice now and then. The bony framework should receive its share of attention. Anomalies of ribs occur in about one per cent of individuals. Evidences of old fractures should be recorded. Scoliosis may have an important bearing on interpretation for or against heart and aortic abnormalities. The appearance of the soft tissue of the chest wall may sometimes be of value, especially in the estimation of emaciation. It is well to examine all of the anatomical structures in some definite order. The heart and aorta are the next ones for routine observation.

The normal heart shadow varies considerably with the position of the individual, his size, the amount of abdominal fat and distention, the phase of respiration and the distance of the x-ray tube from the film when the exposure is made. The various effects upon the size and outline of the cardiac silhouette under the influence of certain heart lesions must be understood. The size of the heart shadow in rather advanced silicotic individuals who are apt to have a considerable degree of emphysema is almost invariably comparatively small in the sagittal view. This is due to a certain amount of rotation caused by the emphysema. Any estimations of increased size in these individuals must usually be made from the lateral view of the chest. Any estimation of size in the sagittal view must be made with the individual in the erect posture and the film in front of him. Tube-target-film distances of less than four feet give misleading information as to size.

Normally the arch of the aorta does not extend appreciably to the right of the shadow of the spine if the patient is symmetrically placed. Scoliosis may make it appear dilated. Tortuosity in the aged may also be misleading in this way, especially with the long sagittal dimension of the emphysematous chest and the resulting widened horizontal arch. All of these possible sources of error should be eliminated by the fluoroscopic examination. The aortic knob on the left should always extend more or less beyond the left border of the spinal shadow.

The position of the trachea is often of great value in differential diagnosis. It should be visible down to and including the bifurcation in all properly exposed films made in both the sagittal and lateral directions. In the former it should always occupy a midline position at the suprasternal notch with the barest perceptible deviation to the right below this point if the patient is symmetrically placed. Scoliosis may be misleading.

A thorough study of the domes of the diaphragm, including their movements, should be made in every case examined. They may hold the key to the diagnostic situation. The function or excursion, position or contour of the dome may be altered by a surprisingly large number of conditions of the phrenic nerves, lungs, pleura, air passages, the diaphragm muscle itself and subphrenic lesions. A study of movement and contour plays a most important part in the diagnosis of silicosis and the estima-

tion of disability. Dome excursion is very variable in healthy indivduals. It is more extensive in athletes and in older individuals, barring extensive emphysema, and in men than in women. Broad, regular inequalities in level are usually not abnormal in the absence of localized restricted movement and provided subphrenic conditions, such as localized enlargements of the liver, can be excluded. Sharp peaks or tenting are abnormal and are due to pleural adhesions or fibrous changes in the lungs, often enhanced by emphysema. Pleural adhesions are apt to be at the locations of the interlobes, but may be anywhere.

The lung markings are very important in many respects. Misinterpretations of normal variations are responsible for many incorrect diagnoses, and a knowledge of the normal appearance and of all conditions which may alter this is very essential. The normal lung markings are the shadows of the structures which accompany the bronchial tree, namely the arteries, the veins in the more proximal portions of the tree and the supporting structures. In reality they represent the bronchial tree. The heavier shadows are called the trunk shadows and their ultimate and barely visible terminations are familiarly known as linear markings. In cases in which there is unusual prominence of the interlobular septa, as from fibrosis or lymph block, these shadows are confused with the linear markings.

Naturally the trunk shadows, and sometimes the linear markings, can become greatly intensified by many abnormal conditions which cause more dense or wider shadows to be cast because of fibrosis, lymphatic engorgement, circulatory states or inflammatory conditions or excessive amounts of secretion or lack of air in the air passages. Hence it will be readily understood that the peribronchial, perivascular-lymph node type, or the so-called first stage of pneumoconiosis must be differentiated from a large number of conditions, such as the natural fibrosis of age, passive congestion from cardiac decompensation or following directly, but temporarily, after coronary thrombosis, polycythemia, acute bronchitis, chronic tracheobronchitis, especially associated with upper respiratory tract infections, bronchiectasis acquired either in adult life or in early childhood as a result of interstitial lung changes, hypoventilation as after abdominal operations, or the unusual type of permeating carcinomatous or other malignant metastases. Mild emphysema may intensify the trunk shadows by contrast, but marked emphysema is apt to partially wipe them out unless exposures are made with less penetration. Too little penetration greatly intensifies the normal shadows, especially if there is a moderate degree of emphysema present. In view of these facts it is unwise and unsafe to base a diagnosis of pneumoconiosis upon the appearance of trunk and hilum shadows alone, without evidence of slight nodular or interstitial types of pneumoconiosis in addition. Too close approximation of tube target and film during exposures will also intensify the trunk shadows.

It is highly essential for the experienced interpreter of chest roentgenograms to be familiar with and be able to identify by name the various prominent trunk shadows just as he must know their normal appearances. This amounts really only to a knowledge of the anatomy of the major branches of the bronchial tree, which we may briefly review:

The *left bronchus*, at least part of which can usually be seen in the average normally exposed stereoscopic roentgenograms of the chest, especially by contrast with the overlying dense shadow of the left pulmonary artery and vein, comes off at a more acute angle and is longer than the right for the reasons that it has no middle lobe branch to give off and must pass under the pulmonary artery and vein and the aorta. It divides into the upper and lower lobe branches. The *upper lobe bronchus* continues the curve of the main bronchus and continues under the pulmonary artery and aorta. Its branches must be designated by the trunk shadows, as follows: (1) the vertebral trunks paralleling the spine; (2) the second interspace trunks which take the general direction of the

FIGURE 1. Attempted lipiodol injection into obstructed right upper lobe bronchus of the case illustrated in figures 3 and 4. This failed and the opaque medium passed into the middle and lower lobe bronchi. A, middle lobe branch of stem bronchus. B, branch of lower lobe bronchus to apex of lower lobe. C, D and E, anterior mesial and posterior divisions respectively of the lower lobe bronchus.

second interspace; (3) the lingual tip trunk to the lingual tip of the left upper lobe to the left of and partially overlying the heart. The *lower lobe bronchus* is longer than on the right side because it corresponds to the right stem plus the right lower lobe bronchus. It can be identified in the sagittal view as a hollow structure.

It divides into very numerous branches which have to be designated and recognized as trunks. There is first a single trunk which is given off to supply the apical portion of the lower lobe. The terminal branches are usually divided into four main divisions, the anterior, mesial, lateral and posterior. These are best seen as three divisions in the lateral view (fig. 1) as anterior, mesial and posterior divisions. Named designations go no further than these main divisions.

The *right bronchus* comes off at a more obtuse angle and is shorter than the left, because of its lack of arterial relations. The *upper lobe branch* passes over instead of under the pulmonary artery and is not so well seen. It has, of course, no lingual tip branch or corresponding trunk. The other trunks have approximately the same relations as on the left side. That portion of the right bronchus between the upper and middle lobe branches is usually designated as the right *stem* bronchus for purposes of special identification. The right pulmonary artery passes over it. The artery and its main branches cast very prominent shadows on the right side and are separated from the right cardiac border by a semi-clear space and help to form the right hilum shadow. Opacity of this space in properly exposed roentgenograms is evidence of some abnormal condition. The *right middle lobe bronchus*, visible as only a trunk shadow, comes off from the anterior aspect of the stem bronchus and passes anteriorly, and hence seems very short in the flat roentgenogram because of foreshortening. Its true relations and direction are better seen stereoscopically (fig. 2). The air passage below the middle lobe branch becomes the *lower lobe bronchus*, also visually represented by a heavy trunk shadow. The branch of the lower lobe bronchus to the *apex of the lower lobe* has a somewhat unusual relation, not generally realized, in being given off at the same level as the middle lobe branch, and these two trunks are apt to be confused in the flat roentgenogram. The terminal lower lobe trunks have approximately the same relations and distributions as in the left lower lobe.

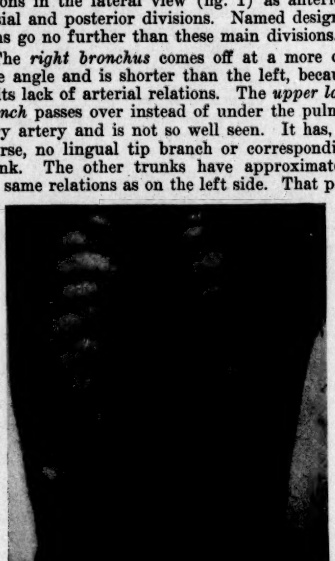

FIGURE 2. Bismuth insufflation made by Dr. Gabriel Tucker into the right middle lobe bronchus, C. It is shown as it bifurcates from the stem bronchus, B. The lower lobe bronchus and some of its branches are faintly outlined, D and E. As the top of the upper lobe bronchus is faintly shown at A, the upper and lower limits of the right hilum shadow are indicated at A and E.

The *hilum shadows*, through altered appearance, contribute their share in the picture of pneumoconiosis in many instances, as when the perivascular-peribronchial-lymph node type or aspect is predominant. Normally they are hazy, conglomerate shadows, irregular and indefinite in outline but fairly constant in extent. They are composite shadows made up of those of the right and left bronchi, pulmonary artery and vein, lymph nodes and the supporting connective tissue around the root of the lung. Their prominence depends largely on the absence of any air containing lung structure. They are subject to considerable variation in appearance within normal limits and differences in x-ray penetration. The only prescribed normal density designated by the Normal Chest Committee[6] was that the constituent trunk or vessel shadows should be seen through and they should not be made up of any solid mass of homogeneous shadow under normal exposures. The right hilum was designated as extending from the top of the right main bronchus above to the point of division of the right lower lobe bronchus into its terminal trunk divisions below. The left hilum shadow was prescribed as extending from the upper border of the pulmonary artery shadow above to a similar point below. Posterior and lateral dimensions could not be defined. The proper conception of the normal appearance and extent of the hilum shadows in cases of suspected pneumoconiosis is very important. In the perivascular-peribronchial-lymph node predominance the enlarged and fibrotic pulmonary lymph nodes will cause an enlargement and increased homogeneity of the hilum shadows, and the prominence will be further increased by the added density of the contained trunk shadows. The approximate correct position of the hilum shadows is important in helping one to decide upon displacements as a factor in differentiating chronic tuberculous lesions and the fibrotic consolidations of terminal silicosis.

The approximate locations of the fissures and lobes of the two lungs are often of extreme importance. In flat sagittal roentgenograms of the chest one cannot determine the lobar location of any lesion with any degree of accuracy unless it involves the base of an upper lobe. For many years the only way we had of determining lobe localization was by stereoscoping the trunk shadows when they could be correctly identified. A dense lesion would blot these out. When we

began to realize the value of the lateral view in collecting our negative series for compilation of normal chest data, we found numerous instances of interlobar pleural thickening which served to outline the interlobes to good advantage. Figures 3 and 4 show the location of the three lobes of the right lung as well as any instance which we have observed. The height of the apices of the lower lobes is very variable and is extremely high in some individuals. This is well shown in figures 5 and 6 by lipiodol injection of the lower lobe bronchus. The height of the left is more variable than that of the right.

The lateral view of the chest is always important in the examinations of cases of pneumoconiosis. As previously stated, it usually gives the best index as to cardiac size in advanced silicotics with considerable emphysema.

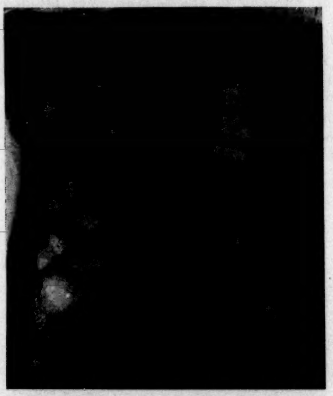

FIGURE 3. Posteroanterior view of the chest of the case represented in figures 1 and 4. An abscess in the right upper lobe partially obstructed the upper lobe bronchus, with resulting slight atelectasis in addition to the lesion. The sharp outline of the base of the upper lobe is well shown. Below this dense lobar border are the middle lobe and most of the lower lobe.

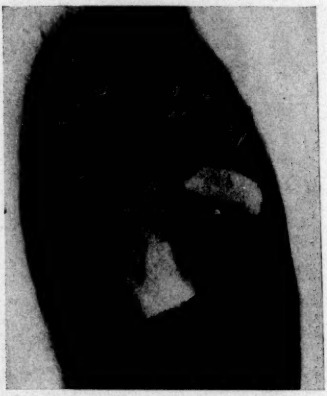

FIGURE 4. Lateral view of the case illustrated in figures 1 and 3. The upper lobe is plainly indicated by its density due to the abscess and the slight atelectasis. The latter condition is not sufficient to cause much shrinkage in the size of this lobe. The main interlobe, A, C, is quite distinct. The upper limit of the middle lobe is seen at the fissure, B, and the lower limit at C. This lobe is a little wider from above downward than normal, owing to the upper lobe atelectasis. The posterior apex of the middle lobe is indicated by the arrow. The boundaries of the lower lobe are quite obvious. Compare the level of the apex with figures 5 and 6.

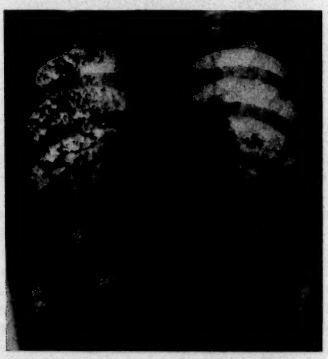

FIGURE 5. Posteroanterior view shows the injection to have reached the first anterior rib level. The clubbed ends below indicate the bronchiectasis.

FIGURE 6. Lateral right view indicates that all of the lipiodol, and especially the upper shadows of it, is in the lower lobe. This shows an unusually high level of the apex of the right lower lobe.

FIGURES 5 and 6. A case of bronchiectasis of the right lower lobe. A lipiodol injection was made by Dr. Gabriel Tucker directly into the right lower lobe bronchus for purposes of diagnosis and localization.

The anterior aspect of the cardiac border is normally in close contact with the anterior chest wall for a variable distance (fig. 7). Backward displacement by inclination is a common finding

FIGURE 7. Lateral view of a negative chest of a female aged 43 years, showing the absence of roentgenological evidences of emphysema. Note the close approximation of the heart shadow to the anterior chest wall and the comparatively little aerated lung in front of the base of the heart and ascending aortic arch and between the posterior border of the heart and the vertebral bodies. The spine is straight and there is no unusual forward curving of the anterior chest wall.

in lower lobe atelectasis. The contact with the anterior chest wall varies with the amount of aeration of the lingual tip of the left upper lobe, being much less in athletes and in emphysema and greatest in thin individuals. The most reliable diagnosis of emphysema, as stated in the Normal Chest Committee Report[6] is to be based upon observations of the lateral roentgenogram of the chest. The great increase in lung structure between the anterior cardiac border and the anterior chest wall is due to the hyperaeration of the lingual tip of the left upper lobe and the right upper lobe seen through (fig. 8). In addition to this there is a considerable increase posteriorly in the cardiospinal space, also represented by lung tissue of the lower lobes. Both of these observations may be made in athletes, but in the emphysematous chest, and especially that of the silicotic (fig. 8), there is apt to be a forward bowing of the anterior chest wall and a marked posterior curve of the spine, which tend to increase the lung space in front of and behind the heart. The more obtuse angles of the ribs with the spine are of little value in the diagnosis of emphysema. The rib inclination in the athlete is quite similar to that of the emphysematous subject, and in fact, it may not be abnormally affected at all in the latter. Increased lung radiotransparency is the rule in advanced emphysema, but is usually to be regarded as a hinderance in correct interpretation of normal lung shadows rather than an aid in diagnosis. It certainly fails to be a correct index as to the amount of emphysema, especially in the presence of passive congestion, marked fibrosis and extensive lung lesions. Depressed diaphragm domes, while common in emphysema, are not reliable as a diagnostic sign. The depth of the posterior costophrenic angle is extremely variable. It is usually deepest in thin individuals and children. This depth has been one of the most valuable findings in the lateral view, because in this posterior costophrenic sulcus many a lesion or effusion which was hidden by the tops of the diaphragm domes in years gone by is now readily detected by the lateral chest roentgenograms.

No one can understand the pathology of pneumoconiosis without a basic knowledge of the histology of the lungs, and especially of the

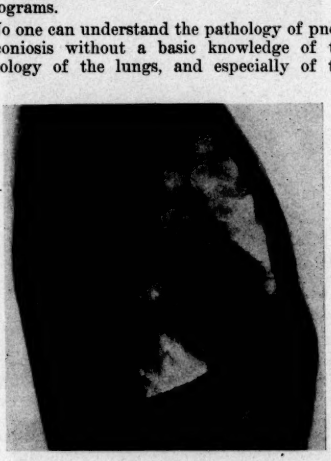

FIGURE 8. Lateral view of a typical emphysematous chest, male, aged 54 years. Note the lack of approximation of the heart shadow to the anterior chest wall, the large amount of aerated lung (anterior portion of the right upper and lingual tip of the left upper lobes) in front of the heart and aorta and the wide space between the posterior cardiac border and the vertebral bodies. The spine has a wide backward curve and the upper anterior chest wall curves abruptly forward. The ribs are more horizontal than in Figure 7, but they do not differ in this respect from the inclination found in the chest of an athlete.

primary lung lobule with its terminal air passage system and alveoli and of the lymphatic system. We are indebted to Miller[7, 8, 9] for much of our knowledge of these structures and whom we must quote at length. The final divisions of the interlobar bronchi of the secondary lobules are into respiratory bronchioles which enter the primary lobules or lung units. These passages differ from the more proximal ones in not being lined by ciliated epithelium and in having some alveoli opening directly into them (fig. 9). Within the primary lobule the respiratory bronchiole divides into two or three alveolar

ducts (ductuli alveolares); each of these into several atria; each atrium opens into several sacculi alveolares, and each sacculus has a circumference of alveoli, similar to those communicating directly with the respiratory bronchioles and alveolar ducts. Probably the majority of pathologists now believe that the alveoli are lined by endothelium and not epithelium. Each primary lobule is entered by a

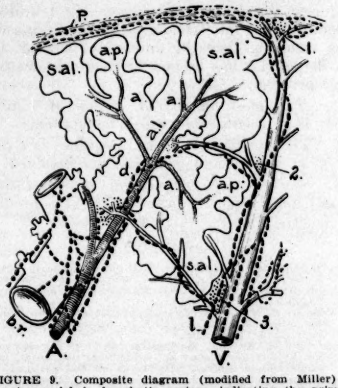

FIGURE 9. Composite diagram (modified from Miller) of the primary lobule lymphatic system, indicating the primary distributions or accumulation points for dust which will lead to predominant phases of pneumoconiosis. b. r., respiratory bronchioli; d. al., alveolar ducts; a., atria; s. al., sacculi alveolare; a. p., alveoli; a. $p.^1$, alveoli opening into respiratory bronchioles and alveolar ducts in close relation with the origins of peribronchial and perivascular lymphatics; A., branch of pulmonary artery, accompanying the air passages; V., branch of pulmonary vein in interlobular septum; P., pleura; P. B., peribronchial lymphatics; P. V., perivascular lymphatics; 1, 2, 3 and other dotted areas, lymphoid deposits. (By previous permission of Dr. W. S. Miller.)

small pulmonary artery branch which accompanies the air passage. The veins are found this far out entirely in the interlobular septa.

There are four sets of lymphatic vessels to be recognized as starting in the primary lobule, those of the bronchi, those of the artery, of the vein and of the pleura. The peribronchial lymphatics originate within the bronchial walls and form a network which extends centrally throughout the entire air passage system to the pulmonary lymph nodes. Their most distal origin is at the point of division of the respiratory bronchioles. The periarterial lymphatics, a single trunk in the primary lobule, communicates with these. The lymphatics accompanying the vein in the septum arise farthest out because their ultimate radicles communicate with the pleural lymphatics. In addition, each venous radicle has an accompanying lymphatic trunk which joins the main one on the septum where the venous radicle joins the vein. These radicle trunks communicate with the periarterial and peribronchial vessels. The lymphatic network of the pleura communicates with the venous trunks in the septa. A knowledge of this lymphatic system is most essential for a proper understanding of the distribution of silica and some other phagocyted dusts.

Almost equal in importance is a knowledge of the presence and location of certain small lymphoid deposits throughout the pulmonary structure (fig. 9). They are found at the following locations: (1) at the junction of venous radicles at the pleura; (2) at the junction of venous radicles with the veins in the septa; (3) at the angle of division of the respiratory bronchioles and alveolar ducts and at the divisions of all branches of the bronchial tree going hilumward. They become larger and larger until at the more central divisions of the tree they become true lymph nodes. The direction of lymph drainage is toward the hilum except the lymphatics coming from the pleura covering the lower half of the lower lobe and some from the adjacent portion of the lung pass through the ligamentum pulmonale to reach the preaortic nodes and not the hilum. The lymphoid deposits are important in pneumoconiosis, as in some pulmonary infections as tuberculosis, because they are halting places for phagocytes carrying dust particles. Silica particles or hydrated colloidal silica deposited in these areas cause what are probably the initial changes in silicosis, with cell infiltration, cell proliferation, cell destruction and ultimate fibrosis. The hilumward drift of silica laden phagocytes, no doubt in relays, continues until the lymph channels become blocked by enlargements at the sites of the lymphoid deposits. These seats become larger and larger and finally conglomerate masses are formed as the forerunners of the ultimate macroscopic nodules, or the nodular aspect of the condition. The blocked vessels with smaller nodules along the course of the bronchial tree, together with enlarged and more or less fibrotic pulmonary lymph nodes are responsible for the appearances of the enlarged hilum shadows, prominent trunk shadows and very fine mottling of the perivascular-peribronchial-lymph node aspect of the condition, familiarly termed the first stage. A complete hilumward block causes a by-pass in lymph flow toward the pleura, with pleural changes and thickening characteristic of advanced stages of silicosis. A block in both directions leaves no course open to the phagocytes except to pass through the walls of the lymphatic vessels into the interalveolar interstitial tissues, as Gardner[10] has shown, with the resulting interstitial fibrosis. If the intake of silica is unusually rapid and both hilumward and pleuralward blocks occur early, this interstitial aspect of the condition will predominate, without prominence of any nodular aspect.

This absence of the nodular aspect of the

condition in individuals affected in certain industries, the inability to differentiate the abnormalities in hilum and trunk shadow prominence in the more advanced and in the very rapidly developing cases and the presence of evidences of interstitial fibrosis developing directly into the terminal stages were the important factors in persuading us to give up the numerical stages of progression in pneumoconiosis and to adopt types or phases of the condition clearly interpreted from roentgenographic appearances and portraying actual pathological changes.

These roentgenological phases of the condition which we have described previously[11, 12] may be briefly summarized as follows:

1. The perivascular-peribronchial-lymph node aspect due to the relaying of phagocyted dust to the pulmonary lymph nodes and their subsequent enlargement and ultimate partial fibrosis to the gradual enlargement of lymphoid deposits along the course of lymph vessels and the subsequent thickening of these vessels and stasis of contents. This is characterized roentgenographically by increased prominence of the hilum and trunk shadows and linear markings. This appearance is by no means characteristic of pneumoconiosis alone, and even if it does indicate the condition, the phase is absolutely not incapacitating. It, together with a barely perceptible appearance of macroscopic nodules, corresponds to the so-called first stage.

2. The nodular aspect is due to the gradual enlargement of lymphoid deposits and their coalescence into quite apparent macroscopic nodules symmetrically scattered throughout both lungs. This corresponds to the so-called second stage. It is conspicuously absent in many industries, especially when the silica intake is rapid.

3. The interstitial type of the condition results from a hilumward and pleuralward block in the lymphatics and the escape of dust phagocytes in large numbers into the interstitial interalveolar tissue and subsequent fibrosis. It appears as a faint homogeneous haze, first on the right side, then on the left. If the silica intake is comparatively slow, it may accompany the perivascular-peribronchial-lymph node aspect, but if more rapid, it may be associated with the nodular type or may progress without the latter directly into the terminal stage of the condition without any evidence of nodulation. The unprotected or inadequately protected sand blaster, sand pulverizer, and sandstone abrasive worker or granite cutter have been among those especially prone to present this rapid interstitial aspect.

4. Terminal and incapacitating silicosis is characterized by three general appearances,—a terminal diffuse fibrosis of a conglomerate nodular type, one which is quite similar in appearance to a generalized chronic fibroid tuberculosis and the terminal stage characterized by large fibrous consolidated areas, which closely resemble tuberculous consolidations quite frequently, but which we are now learning to differentiate one from the other.

In conclusion, it may be said that:

1. Pneumoconiosis, a hitherto interesting but little understood condition on the part of the majority of physicians has come into unusual prominence of late, not only because it is a disease resulting from an industrial hazard, but also because it has become a prominent medico-legal problem.

2. The most important means of clinical study is by roentgenological investigation.

3. The roentgenological appearance is a portrayal of the pathological processes involved.

4. Correct roentgenological interpretations must depend upon the correlation of a number of essential factors, which are stressed.

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Discussion

CHAIRMAN TROWBRIDGE: The first speaker to discuss this paper will be Dr. W. Irving Clark, of Worcester, who is associated with the Norton Company. Dr. Clark.

DR. W. IRVING CLARK, Worcester: Dr. Pendergrass in his admirable paper has discussed the roentgenological appearances, and the pathological anatomy underlying these appearances in that much discussed disease, pneumoconiosis.

I am not a roentgenologist, but an industrial physician and will therefore talk about the clinical significance of his paper.

In making examinations and re-examinations of workers exposed to the continual inhalation

of artificial abrasive dust which contains no free silica, and comparing these examinations with the x-rays of the chests, I have been struck by the complete lack of symptoms and of physical signs present even after many years of exposure.

The type of chest shown by x-ray in these cases is that in which there appears to be an increase in hilum and trunk shadows with occasional cases showing a few slight nodules. The vast majority, therefore, belong to the perivascular, peribronchial lymph node type. This differs from silicosis where, after sufficient exposure, the nodular or conglomerate nodular type appears to predominate.

I am mentioning this particular type of dust, as I believe it to be fairly representative of any of the non-silicious dusts in its effect. There is a great deal of information at present available upon the pathology, symptoms and x-ray appearance of silicosis and of silico-tuberculosis, but very little upon other forms of pneumoconiosis.

Experiments by Gardner and others suggest that inorganic abrasives, non-silicious in composition, do not provoke the excessive formation of fibrous tissue, and those x-rays which I have seen, tend to bear this out. Russell has had a similar experience among cement workers. If we could say that fibrosis is present in pathological amounts only in the lungs of patients who have been exposed to the prolonged inhalation of dust having a high percentage of silica, and a few of its compounds, such as magnesium silicate (asbestos), a problem which is at present very complicated would be clarified.

In order to come to any such conclusion, however, autopsies upon patients sufficiently exposed to these dusts and suffering accidental death, or death from non-respiratory disease, are essential. The next interesting question is the connection between tuberculosis and dust inhalation. It appears to be difficult to diagnose from the x-ray alone, certain cases of tuberculosis from tuberculosis and silicosis combined, when the process is advanced. This has just been pointed out by Dr. Pendergrass. But in the early stages, there are often found to be tubercular processes coincident with an early x-ray manifestation of silicosis. Apparently the only way that the activity of this process can be determined is by careful clinical examination.

Experimental work with animals both here and abroad shows that silica has an activating effect upon the tubercle bacillus, and investigations of silicotic granite cutters suggest that the fibrous tissue which inhalations of silica dust so abundantly form is peculiarly susceptible to fresh infection from the same bacillus.

So far no reports have been made as to similar dangers to those exposed to non-silicious inorganic dusts.

Gardner's experiments suggest that non-silicious dusts do not activate tuberculosis, but experience with human material in large numbers is lacking.

In closing I should like to have Dr. Pendergrass tell briefly the x-ray appearance and the underlying pathology of the pneumoconioses which are not the result of inhaling a dust containing free silica or a silica compound.

CHAIRMAN TROWBRIDGE: The next speaker to discuss this paper is Professor Philip Drinker of the Harvard School of Public Health. Professor Drinker.

PROFESSOR PHILIP DRINKER, Boston: Silicosis is caused by breathing dust; the obvious remedy is to inhale clean air. If factories and mines are dustfree, no silicosis or pneumoconiosis results. By plant managers, we engineers are often asked the embarrassing question: "How clean must we have our air in order that our men shall no longer run any chance of getting silicosis?" They would like a positive answer in terms of a certain number of milligrams of dust per cubic meter, or a certain number of dust particles per cubic foot, but generally we cannot give these positive answers. Our best effort is to make a reasonable estimate of permissible dustiness and then try to correlate that dustiness with medical findings, chiefly by x-ray, and thus attempt to arrive finally at a figure of safe dustiness.

The few slides which I have to show will, I hope, bring out the difficulties from the engineering standpoint and the problems which confront us every day.

(Slide.)

The first represents conditions in the South African gold mines where silicosis was a problem of the first order. In 1905 the dust concentration was around 150 milligrams per cubic meter or sufficiently high to obscure a bright light at a distance of a few yards, conditions which I have seen in American factories even today. Under these conditions the prevalence of industrial tuberculosis was about 30 per cent.

They then started reducing the dust concentration and succeeded in getting it down to approximately 20, but the incidence of industrial tuberculosis did not drop until several years later. Therefore it follows that if a factory with a severe dust problem reduces dustiness it may not show actual results (in reduction of silicosis) until some years later. That to the manufacturer and plant manager, is an extremely disturbing point and one which naturally has a huge economic significance. In South Africa, dustiness is now down to somewhere near 1 to 2 milligrams per cubic meter, with the result that this figure has been given as the

so-called South African standard of permissible dustiness for pure quartz. They are mining gold, of course, but the gold is embedded in rock which is virtually pure quartz.

In order to reduce dustiness, they drill wet. Due to recent work, both in England and in this country, J. S. Haldane suggested that perhaps they could improve conditions if they actually injected into the air carbon dust along with the silica, the idea being that carbon is notably more readily phagocytosed than quartz, so that the presence of carbon dust might reduce the hazard of the silica.

(Slide.)

This diagram shows the influence of dust on pulmonary tuberculosis in relation to the free silica content of the dust. With pure quartz the incidence is 77.8 per cent; with grinders and tool sharpeners using sandstone (50-100 per cent quartz) it is close to 50 per cent; and among granite cutters (30 per cent quartz) it is 47.8 per cent. In coal mining there is generally no silica exposure except from the rock which surrounds the coal seam. The tuberculosis rate is relatively low. In general, then, the severity or frequency of silicosis increases rapidly with the quartz content of the dust.

In apparent contradiction to this are the cases of asbestosis which are now developing. In asbestosis there is virtually no free quartz except as an impurity. Asbestosis is a condition which, from the standpoint of the engineer, is fully as serious as silicosis but from the chemical and medical standpoint the two pneumoconioses should be distinguished.

(Slide.)

This shows a phagocytic cell which I obtained from the sputum of a man working in a dusty factory. The dust particles which are in the cell average about one micron in size, with the phagocytic cell measuring 15 and 16 microns. At autopsy silicotic lungs show particles averaging about this same size, namely 1 micron.

(Slide.)

These are the so-called asbestosis bodies in the sputum of a man who had been inhaling asbestos dust. The magnification in this case is lower than in the photomicrograph of the phagocytic cell, but the size of the asbestosis bodies is relatively enormous. Chemically these bodies are not asbestos. Their presence in the sputum does not mean necessarily that the man inhaled bodies of that size in his lungs; similar appearing bodies are found in men not exposed to asbestos dust.

(Slide.)

It is common now in dusty factories to require men to wear masks and respirators of various sorts. This slide indicates how the effectiveness of such a device can be tested. For testing work we require the man to wear the device in question, and while performing moderate work, he breathes through the respirator air of known dustiness. For such experiments we use limestone (it being notably non-harmful to man), and then determine the amount of dust that is actually in front of his nose and mouth inside the respirator. We can thus tell how effective the respirator is, and it is perfectly possible today to develop a mask which will protect man against particles as small as a quarter of a micron or particles which may run to 35 or 50 microns. However, no one likes to wear a mask for an eight-hour day, and the question of asking men to wear any such protective device should be considered as secondary to a dust removal system.

(Slide.)

It is perhaps difficult for you to visualize subjecting men to dust clouds of known concentration, and I show this slide simply as an illustration of the fact that we can subject men or animals to dustiness of very accurately controlled concentration. In this instance, we were studying the effects of breathing zinc oxide which causes the so-called brass ague or metal fume fever. We measured what the subject inspired and expired and thus found what he retained.

It is not at all unreasonable to demand that, from an engineering standpoint, we should control dustiness to any figure you name. It is equally fair for us to demand that you coöperate in trying to correlate our findings with the medical findings. Unless there is some reasonable coöperation we will continue in the present chaotic state, with floods of compensation suits, some of which are bona fide, but many of which are certainly not.

CHAIRMAN TROWBRIDGE: I am asked to announce that there will be a meeting of the presidents and secretaries of the District Societies with Doctor Stetson at 11 o'clock in Room 408.

The next person to discuss this paper is Mr. Theodore F. Hatch, instructor in sanitary engineering, Harvard University. May I suggest that the time limit on discussion be adhered to. Mr. Hatch.

MR. THEODORE HATCH, Cambridge: Prevention of silicosis is primarily an engineering problem of dust control. The most direct means of control is through the introduction of new methods of operation which are dust-free. Unfortunately this sort of control usually means major changes in the methods of manufacture and it is therefore limited in its application. Of much wider application is the use of local exhaust ventilation, the function of which is to capture the dust as it is generated and remove it from the air.

Suction hoods of suitable design are located as close as possible to the various points of dust generation. They are connected to an exhaust

fan and dust-collecting equipment through a system of exhaust pipes. The dust is captured by the rapid flow of air into the hoods and is conveyed to the collecting plant where it is removed from the conveying air. Such a system may be likened to the lymphatic system of the lungs. The exhaust hoods may be compared with the phagocytes, the conveying ducts with the lymphatics, and the lymph node finds its counterpart in the dust-collecting apparatus.

The design of exhaust systems must be varied to meet the wide variety of conditions found in industry but always with the same basic principle of operation. This method of dust control has been used successfully in many industries where silica dust is generated. A recent application of local exhaust ventilation to rock drills used in building excavation work, quarries, and mines serves to illustrate the general problem of design and operation of this method of control. (Illustrated by slides.)

CHAIRMAN TROWBRIDGE: The next speaker to discuss this paper is J. J. Bloomfield, a sanitary engineer connected with the Bureau of United States Public Health Service, at Washington.

J. J. BLOOMFIELD, Washington: Dr. Pendergrass' illuminating discussion on the deviations from the normal chest, as seen in the various types of pneumonoconioses studied by him, emphasizes very clearly the need for a knowledge of those characteristics of industrial dusts which determine their capacity to produce lung pathology. It is interesting in this connection that the studies conducted by the Public Health Service on the health of workers in dusty trades showed, among other things, that certain kinds of respiratory diseases were more prevalent than others, depending on the type of dust exposure. For example, exposure to cement dust and anthracite coal dust was associated with a high rate of illness from grip, whereas in the bituminous coal industry bronchial diseases and pneumonia were excessive. In the granite-cutting plants, tuberculosis and pleurisy were the most frequent types of illness experienced. On the other hand, some dusts were found to produce no excessive illness from respiratory diseases under the conditions studied by us.

It is quite obvious that in a consideration of the industrial dust problem, one should take into account the nature of the dust, the size of its particles and the degree and length of exposure. It is essential to determine the composition of a dust, because it is now believed that the degree of health hazard associated with the inhalation of fibrosis-producing dusts, all other factors remaining constant, is dependent upon the mineralogical composition of the dust. For this reason we have resorted to a combined chemical and petrographic analysis of dusts, since it has been found that this type of analysis yields a fairly accurate index of the nature of industrial dusts.

The question as to the relative significance of the various sizes of dust particles in the production of lung fibrosis has as yet not been satisfactorily answered. However, it is known that the inhalation of certain industrial dusts has been found to be associated with definite injury to the pulmonary tissues. Hence a knowledge of the size-frequency of these dusts might cast some light on this subject. Of equal importance is the fact that such data will determine, to a large degree, the type of dust sampling instrument and the method of dust counting to be employed for evaluating the industrial dust hazard. The work of the South Africans and the more recent work of Scheid of Germany, on the size of dust particles recovered from human silicotic lungs, suggest that only those particles ranging from 0.5 to 5 microns in size are of importance, since the majority of the dusts recovered from lung tissue were found to be between one and three microns in size and only a small percentage was less than 0.5 microns. These results raise two pertinent questions, namely, (1) to what extent are minute particles of dust retained by human lungs, and (2) do appreciable percentages of ordinary industrial dusts ever fragment into those minute sizes less than 0.5 microns?

The work of Professor Philip Drinker and his associates on the retention of dusts and fumes by man seem to indicate that the particles less than 0.5 microns in size are not so effectively retained in the lungs as are larger particles. Dr. Owens, of London, England, in studying the amount of dust in expired air when breathing London air, found that only 25 per cent of the dust was retained. The average size of the dust inhaled in Owens' experiments was about 0.5 microns. As to the ability of the ordinary industrial process to fragment appreciable quantities of dust to a size less than 0.5 microns, our studies of the size-frequency of atmospheric industrial dust show that only about two per cent of the dust is less than 0.5 microns, our studies of the size-freless than one micron. The majority (69 per cent) of the dust was found to be between one and three microns. On the other hand, our recent studies on the size-frequency of outdoor dust show that 97 per cent of this type of dust is less than one micron. It is obvious, therefore, that in order to obtain a representative sample of industrial dust one should employ an instrument capable of arresting with a high degree of efficiency particles of the size found in industrial air and that the method of enumerating the dust should differentiate the sizes found in normal air and those found in industrial air. This differentiation appears to be sharply marked in so far as the dust particles between 0.5 and 5 microns are concerned.

The impinger apparatus, used in all our dust studies for the past ten years, and by many other persons engaged in dust investigations in this country as well as abroad, has been shown to be highly efficient in collecting dust of a size found in industrial air. Moreover, it is of simple construction, cheap, and samples obtained with this instrument may be examined either microscopically, gravimetrically or chemically. The method of dust counting which we have been using for many years has been found by us to take into consideration about 90 per cent of the dust collected by the impinger. The small percentage of dust particles of a minute size which our method fails to reveal is negligible, when one takes into consideration the simplicity of our method, the fact that dust counts can be checked by different observers and that it achieves the desired results. As an excellent criterion of the value of our method of dust sampling and counting, one may mention the results obtained in the study of the health of workers exposed to the inhalation of granite dust. In this study it was definitely established that a high correlation existed between the intensity of the dust exposure and the degree of silicosis and active tuberculosis. It is obvious, therefore, that the technique of dust determination which we are using is capable of judging the degree of a dust hazard.

The present meeting is an excellent example of the increased attention being devoted to the hygienic aspects of the pollution of the industrial environment with dust. The results of such careful studies as those described by Dr. Pendergrass, as well as those carried out by the U. S. Government organizations, indicate beyond a doubt that this problem is receiving its due share of attention. Such studies serve to provide us with the fundamental knowledge necessary for the last steps of this important industrial hazard, namely, the mitigation of the dust hazard, a problem to which Professors Drinker and Hatch have contributed many valuable data.

CHAIRMAN TROWBRIDGE: We have about three quarters of an hour before the Council meeting at 12 o'clock, and I will take the liberty of calling upon Dr. Frederick O'Brien, who would like to discuss this paper briefly.

DR. FREDERICK W. O'BRIEN, Boston: *Mr. Chairman*—The Massachusetts Medical Society, particularly our Section of Radiology, is to be congratulated on having such a distinguished group, known not only nationally but internationally, to discuss this subject of pneumoconiosis. From what you have heard you may readily conclude that it is a combined engineering and medical job so far as prophylaxis is concerned. The situation is rather acute with us at the present time, particularly in connection with our granite workers. It is one of the few health problems in which Massachusetts has lagged behind until recently. Fortunately, we now have in our State Department of Labor in the person of Mr. Manfred Bowditch, a competent industrial hygienist, who is very much alert to the situation and who is going to produce, I am sure, some worthwhile results from his study of the entire problem.

Listening to Dr. Pendergrass the diagnosis of pneumoconiosis appears to be a simple thing, but I do not think he ought to leave us with that understanding. Because he has been working on it for years, the subject has lost its complexity for him. The diagnosis from an x-ray viewpoint is not quite so open and shut as the x-rays that he has shown you would indicate. From the medico-legal viewpoint the roentgenologist should be aware that he cannot make the diagnosis always by x-ray alone. You may need a great deal more than that. At least you need a comprehensive clinical history which will go back for twenty-five years as far as occupation is concerned. It was only yesterday that Dr. Holmes showed us some eighteen cases of non-tuberculous lesions, the majority of which might be classified from a purely x-ray point of view as pneumoconiosis.

I think we ought to abandon once and for all the designation of first stage, second stage and third stage. As a matter of fact I know that Dr. Pendergrass long ago recommended that this be done but from custom continues their use. Peribronchial-perivascular lymph node type; nodular fibrotic type and massive fibrotic type are far better terms because any or all of these may represent relatively early or late lesions depending upon the kind of pneumoconiosis with which one is dealing. He mentioned the matter of cavity denoting tuberculosis in his differential. A cavity in silicosis does not per se mean tuberculosis. It may and does occur in the massive fibrotic type irrespective of whether tuberculosis is present.

I hope Professor Drinker may take a minute to tell us something about free silica and combined silica. One reads in the literature that free silica causes the fibrosis and then one reads that the silicates also produce fibrosis. Do SiO_3 and SiO_4 in combination break down into SiO_2 in the body fluids? I was surprised to hear him say that, with the addition of carbon to quartz, phagocytosis was increased because from Gardner's work with "silica smoke" (pure quartz) I thought that phagocytosis was about as rapid as it could be.

When Professor Drinker was speaking about the ingestion of dust particles I think he mentioned the maximum size as 10 microns. I have in mind the work of Dr. Gardner, who has no doubt but that one can inspire asbestos particles as long as 200 microns.

CHAIRMAN TROWBRIDGE: Doctor Pendergrass will close the discussion.

DOCTOR PENDERGRASS: Some of the questions that have been brought up by Dr. Clark and Dr. O'Brien would require several hours to answer. To answer briefly Dr. Clark's question as to whether pneumoconiosis can be caused by dust other than silica dust; I think that it is possible to have pneumoconiosis due to other dusts. Tuberculosis does not occur so often in pneumoconiosis due to dusts other than silica and silicates.

I am afraid I shall not have time to discuss a number of the points which Dr. O'Brien brought up. The presence of cavity formation in the large massive areas may or may not represent a superimposed tuberculous infection. Cavities may also be due to a Friedländer's infection or result from the transmitted pulsation from a small ruptured vessel.

It is necessary for the roentgenologist to aid in the diagnosis of a superimposed tuberculous infection, as frequently the clinical symptoms are too few upon which to base an opinion. The roentgen signs are as follows: for pneumoconiosis, nodular predominance (non-progressive) type: small, dense, discrete nodules throughout both lungs; interference with diaphragmatic movement; no definite pleural involvement (obliteration of costophrenic suleus); may have peaking of dome. For tuberculosis, miliary type: nodules large, soft, flocculent, with fuzzy border; usually no interference of diaphragmatic movement; may have pleural involvement (obliteration of costophrenic suleus); may have peaking of dome. For combined pneumoconiosis and tuberculosis of the above types the nodules are large (larger than either alone), with dense center and flocculent border.

In the massive fibrotic type of pneumoconiosis the roentgen signs are as follows: lesions usually in upper two-thirds of lung; emphysema of lower one-third; nodules not particularly prominent; lesions usually not peripheral; trachea or hilum not displaced; Bucky film shows trabeculation; interference with diaphragmatic movement; peaking of diaphragm; usually no cavities, if present, due to vascular injuries; no evidence of calcification.

For the advanced fibroid type of tuberculosis the roentgen signs are lesions in the upper two-thirds of lung fields; emphysema marked; nodules not particularly prominent; lesions extend to periphery; trachea displaced laterally and backward; hilum displaced upward; Bucky film shows homogeneous shadow; interference with diaphragmatic movement; peaking of diaphragm; cavities usually present; occasional evidence of calcification.

In the combined type the lesions are usually located in the upper two-thirds; emphysema marked; nodular formation usually best seen in lower lobes; lesions extend to periphery and are usually larger than either alone; trachea displaced; hilum may be displaced; Bucky film shows homogeneous density and cavity formation; interference with diaphragmatic movement; peaking of diaphragm; cavities usually present; evidences of calcification occasionally seen.

CHAIRMAN TROWBRIDGE: May we have the report of the Nominating Committee. Doctor Ring.

DR. ARTHUR H. RING, Arlington Heights: *Mr. Chairman*—The nominations are the following: Chairman, Dr. Charles W. Blackett; Secretary, Dr. Franklin P. Lowry.

CHAIRMAN TROWBRIDGE: Are there any nominations from the floor? There being none, what is your pleasure?

Upon motion duly made and seconded, it was

Voted: To accept said reports, and that the Secretary be instructed to cast one ballot for said nominees.

The Secretary having cast the ballot as directed, the Chairman declared Doctor Blackett and Doctor Lowry elected to their respective offices for the ensuing year.

CHAIRMAN TROWBRIDGE: I now have the pleasure of introducing to you Dr. George L. Stivers, of the Belmont Hospital, Worcester, who will read the final paper, entitled "The Use of Surgical Diathermy (or Endothermy) in Separating Pleural Adhesions in Cases of Pulmonary Tuberculosis."

THE USE OF SURGICAL DIATHERMY (OR ENDOTHERMY) IN SEPARATING PLEURAL ADHESIONS IN CASES OF PULMONARY TUBERCULOSIS*

BY GEORGE L. STIVERS, M.D.†

IN the treatment of pulmonary tuberculosis, an accepted procedure is artificial collapse of the affected lung, with the expectation of closing cavities, relieving symptoms, and eliminating positive sputum. In approximately ten per cent of all cases treated by artificial pneumothorax, a complete collapse is obtained. In another ten per cent of such cases a selective compression of the diseased areas gives satisfactory results. In the remaining eighty per cent, lung compression is ineffectual owing to pleural adhesions which hold the lung to the chest wall.

*Read before the Section of Radiology and Physiotherapy of the Massachusetts Medical Society, June 6, 1933.

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It has been found that in many of these cases the operative procedure of intrapleural pneumolysis, or cutting of these adhesion bands, gives the desired collapse.

Time does not permit the discussion of selection of cases, complications of the operation and the end results. The object of this paper is to describe the use of surgical diathermy or endothermy in intrapleural pneumolysis, as exemplified by a series of lantern slides of this procedure at Belmont Hospital.

Jacobaeus in 1913 devised the first successful instrument introduced through a cannula to illuminate the inside of the chest cavity, with an additional cannula introduced on the opposite side of the thorax to convey the cautery directly to the band to be severed. In 1923 he presented his results before the Royal Society of Medicine. Unverricht in 1922 improved the efficiency of the Jacobaeus instrument by enlarging the size of the series of reflecting Zeiss lenses and increasing the power of the thoracoscopic light. Many modifications of the original Jacobaeus instruments have been made. In some the thoracoscope, cautery and endotherm electrode are combined in one instrument, and all illumination and cutting are accomplished through one cannula, introduced into the chest wall, such as the Cutler Davidson thoracoscope with direct vision.

This single cannula is used by Chandler, Davidson, Maendel and Kornitzer. There are many others, especially Churchill, Kremer, Matson, Maurer and Wells who use the two puncture sites and whose instruments, that is the thoracoscope and the cautery or endotherm electrode, are separate units. The light from the thoracoscope has likewise been variously directed at different angles. Jacobaeus-Unverricht illumination is at a 90 degree angle as compared with the shaft of the instrument.

Davidson and Kremer operate by direct illumination from the tip of the instrument in a direct line with the adhesion. The author is using a thoracoscope especially manufactured by the Zeiss company, with the lens at a 45 degree angle, directed more toward the tip of the instrument.

The author has also designed a heavy curved metal conveyor, about 14 inches in length with a small electric bulb attached to the tip, known as the thoracolux. This light can be guided to any part of the chest cavity and in combination with the unlighted thoracoscope can be used to determine the consistency of the bands. At Belmont Hospital the thoracolux has proved a most useful instrument in finding lung tissues and blood vessels in the bands and in outlining cavities.

Concerning the instruments used for severing the adhesions, there is a difference of opinion. There are two principal types in use. First, the galvanocautery, a hot cutting point, and secondly the endotherm, a cold coagulating and cutting electrode.

Originally, the galvanocautery at various degrees of intensity was used by all operators. This apparatus produces a hot point which burns the adhesions, but from time to time it is necessary to suspend operating to allow the cautery to cool, as the heat from the shaft of the cautery may injure the structures of the chest wall around the cannula. Bigger has suggested devitalization of lung parenchyma adjacent to the shaft of the hot cautery as a cause of delayed empyema occurring some days after operation.

The endotherm or surgical diathermy current was introduced in 1924 by Wyeth and may be used for either coagulating or cutting.

The principle of the apparatus is the passage of an alternating high frequency current through the body of the patient, from an active to an inactive pole. The inactive electrode is a large square of soft metal securely bandaged to the patient's thigh. The skin at this point of contact must be dampened and the inactive electrode united with a well-insulated cable to the endothermy machine. Short-circuiting from a loose connection to the inactive pole may occasion a severe burn.

The active electrode is a sharp-pointed instrument which is introduced through the cannula to the insertion of the adhesion on the chest wall. When the coagulating current is applied, the contact area is dehydrated.

It is a cold electrode when not directly touching the tissues and its activity, which is thus easily controlled, is confined to a small area at the point of the electrode. No heat is disseminated to the neighboring structures and its use occasions less pain than the galvanocautery. In using the endotherm knife for cutting, a different kind of electrical energy is used. A minute arc is produced at the point of contact of electrode and tissue. This produces intense localized heat and separates the tissues as in using a scalpel, at the same time sealing the minute lymph and blood vessels. You have probably witnessed the use of the endotherm electrode by Cushing and commented on the ease of operation and the absence of bleeding in the removal of brain tumors.

Jacobaeus and Matson employ the endotherm entirely in severing pleural adhesions, while others like Maurer prefer to coagulate by the high frequency current and then cut with the actual cautery. Churchill and Wells use the galvanocautery alone at a dull red glow. The technic used at the Belmont Hospital, is that of Maurer. A high frequency current from the endotherm electrode is used to produce a zone of coagulation on the chest wall surrounding the band, sealing the lymph and blood ves-

sels. Into this coagulated area the galvanocautery tip is introduced and the actual cutting or enucleation of the band from the chest wall is done. It seems to me that this combination of endothermy and galvanocautery gives the best results.

The close proximity of the active electrode to important structures, within the pneumothorax cavity, necessitates complete unvarying control of a definite gap between the coagulating and the cutting currents.

There is now available a high frequency generator in which large radio tubes replace the spark gap, thus producing a current free from faradic effect.

This is the nearest approach to a serviceable machine that can be safely used for intrathoracic work. The coagulating current has six different stops which regulate the depth of destruction of tissue with remarkable smoothness and perfect control. The cutting current also has six controls in which the intensity of the actual cutting knife can be varied within a certainty. In order that the surgeon may change and modify various currents to his needs, it is considered essential for the switchboard controlling the light, cauterization current and the endotherm current to be entirely under the control of a trained assistant.

As a preliminary to the operation of intrapleural pneumolysis, the bleeding time, clotting time and blood grouping of the patient are always obtained. A large refill of the pneumothorax cavity is done a day or two before operation, to afford a large working space in order to be able to direct the rays of light from the thoracoscope on all sides of the lung for a complete examination. Luminal given twelve hours before operation in divided doses totaling nine to twelve grains, is sufficient to obtain a coöperative but semiconscious patient and then a local anesthetic, novocain, one half of one per cent, injected into the skin and subcutaneous tissue, relieves all pain of operation.

The room used for the operation is darkened, doors and windows covered by dark shades so that no ray of white light will disturb the surgeon while operating. A small ruby ceiling light is the only illumination that is used.

The patient is given the usual preoperative preparation, shave, scrub, sterile dressings the night before and followed in the morning by an iodine and alcohol preparation over the entire hemithorax and the arm to the wrist, for manipulation of the extended arm is sometimes necessary. The head of the table is raised to an angle of 45 degrees so that the patient assumes a semi-upright position for the operation.

An assistant holds the arm of the operative side upward and forward across the side of the patient's face. This position pulls the scapula upward and forward, spreads the interspaces on the operative side of the chest and allows the surgeon more freedom in the movements of the instruments.

No rule can solve the various problems encountered in the introduction of the thoracoscope into the chest cavity and it is only by experience that one is able to determine the most advantageous point of entry. If the adhesions are in the upper part of the thoracic cavity, the thoracoscope is introduced high up in the chest wall under the scapula at about the sixth interspace. If apical adhesions are radiologically proved, the anterior axillary line at the third interspace is often selected.

Following the introduction of the thoracoscope through the cannula into the pleural cavity, the lung, pleura and adhesions are minutely studied. It is important to examine closely the character, color, and consistency of the lung, the presence of possible exudate, and caseous nodes of the lung and parietal pleura. Then the adhesions are studied. Their exact location in reference to important organs within the bony thorax is defined, as well as their shape, size, tension, consistency and the presence of lung tissue or blood vessels. Illumination from the thoracoscope clearly outlines any pathological condition within the chest cavity and a study of the offending adhesions determines the point of introduction for the cautery or electrode.

The color of all adhesive bands is quite significant. The gray blue of lung tissue prolonged into the adhesion is easily discovered by direct light or by the use of the thoracolux placed in back of the band. The bright red of the blood vessels is defined usually at the edge of the band and is unmistakable. The white bleached-out appearance of a string or a membranous fan-shaped band denotes great tension, which is more pronounced as the band is being severed. Caseous exudate and areas of edematous tissue are very prone to be present where there is tension.

In case an adhesion contains lung tissue, it is preferable to coagulate an area around the insertion of the band on the chest wall at the first operation and at a later operative date, complete the cutting of the adhesion. At this time it is usual for the lung to have been pulled away from the chest wall leaving a fibrotic bridge, which can be safely cut. There is considerable risk of hemorrhage or of opening into lung tissue if the galvanocautery is used in a similar way, at the first stage of operation. The wounds on the chest wall after coagulation are barely discernible after eight weeks and the stumps on the lung structure have entirely disappeared.

In coagulating large adhesions it is advisable to use a comparatively weak current for a longer period of time rather than a stronger current for a brief time, for the latter current might occasion quick dehydration or even carbonization of the tissue. This would limit the field of de-

sired coagulation and possibly be instrumental in the causation of secondary hemorrhage. With a small band a stronger and more rapid application of the current may be made with safety.

As cavities are most often situated in the upper lobes of the lungs, so the vast majority of adhesions are noted at the apices, posteriorly or a few centimeters below this location. Next in frequency are the posterior lateral wall adhesions, and least frequent are the anterior apical adhesions. Occasionally a band holding the lung to the diaphragm is defined and is severed with difficulty, due to the motion of the diaphragm.

There are three varieties of adhesions usually observed through the thoracoscope which can be destroyed if they are not complicated by blood vessels, lung substance, caseous nodes or extension of cavity formation into a band.

First, there is the string-like fibrous band, white, glistening, small in diameter, varying considerably in length from one half inch to five inches and usually devoid of blood vessels and lung tissue. This type of band is most often found in the upper two thirds of the chest cavity. It has only a slight amount of tension, is soft, easily stretched and can be flattened out for examination by the point of the galvanocautery. There is no difficulty in cutting this type of band and it results in immediate and complete collapse. Except when found in numbers, these bands are of very little significance so far as collapse of the lung is concerned.

However, it is possible for a single string adhesion to be of such tough non-yielding consistency that the collapse of the lung will be prevented unless it is cut.

Secondly, there is the short thick fibrous band which usually contains lung tissue to within a short distance of its insertion into the chest wall.

A cavity in the lung is often its origin. This band is white, gray, red or dark purple, and one to three centimeters in diameter. It often contains many small blood vessels which do not seem to extend beyond the lung tissue and are seldom apparent in the end attached to the chest wall. It is with great difficulty and much patience that these adhesions are cut, or, more often, enucleated from the wall of the thorax on account of the proximity of lung tissue in the band.

Thirdly, there is the broad fan-shaped adhesion, usually fibrous, varying in thickness and attaching itself to a large area of the chest wall.

The apex of the lung is a favorite location and so firmly is the lung involved in this tissue that it is often impossible to cauterize it without considerable danger. In dividing the fan-shaped adhesions it is desirable to sever them close to the chest wall to allow for the marked retraction of the pulmonary insertion after release of band tension.

In exceptional cases where the endotherm or cautery is used to enucleate the adhesion from the parietal pleura, some pain may be diffused over the hemithorax and, if the bands are located at the apex of the lung, the burning pain will often radiate down the arm of the patient.

The relief of this pain can be accomplished by inserting a long Becton needle through the cautery cannula and injecting additional anesthetic directly into the parietal pleural surrounding the adhesion.

When the bands have been completely severed and there is no evidence of hemorrhage from the stumps of the adhesions, the cannulas are removed and a single suture is inserted in the skin wound. This is supplemented by a deep suture tied over a gauze pad to prevent the annoying skin emphysema which often occurs.

The immediate after-care includes an elevated head and shoulder position with the operative side up for at least 48 hours. Small refills of air are cautiously given, not in excess of 200 cc. at intervals of five to seven days, for a short period and then forcible collapse can be instituted.

SUMMARY

In this paper I have cited the various instruments used in the operation of intrapleural pneumolysis and compared the relative value of each type of instrument.

A short description of the different kinds of adhesions viewed through the thoracoscope, their locations and the method of cutting by the cautery and the endotherm currents has been presented.

CONCLUSION

Intrapleural pneumolysis applied to a properly selected case of pulmonary tuberculosis as an aid to artificial pneumothorax in completing a satisfactory collapse of a diseased lung is a procedure of primary importance in the treatment of this disease.

DISCUSSION

CHAIRMAN TROWBRIDGE: Dr. Edward D. Churchill, Boston, has ten minutes left before the hour of 12.

DR. EDWARD D. CHURCHILL, Boston: *Mr. Chairman and Gentlemen*—The operation of cutting pleural adhesions is a straightforward, logical procedure. The goal of all collapse therapy is to obliterate cavities and to shut off the continual flow of positive sputum. When that goal is not obtained by pneumothorax treatment within a reasonable time (by that I mean two to four months) and it is obvious that an adhesion is holding open a cavity, then operation should be considered. I feel that the indications for pneumolysis are on the basis of symptoms more than on the x-ray finding. If we start out to cut every adhesion we see in

the x-ray films, we are going to be doing meddlesome surgery. It is the case with the persistent cough and positive sputum, at a time when symptoms should have ceased as a result of the pneumothorax, that is a suitable candidate for pneumolysis.

For the benefit of those who have not looked through a thoracoscope, I would say that the beautiful illustrations of Doctor Stivers are in no way exaggerated. All the details can be seen as he has represented.

It is impossible to tell by the x-ray whether the adhesions in an individual case can be severed. The introduction of the thoracoscope is necessary for a survey of the adhesions to determine their operability. I think whether we use the endothermic-electrode or galvanocautery is probably an unimportant technical detail. Personally, I am using galvanocautery because I am waiting until the price of an endothermic cautery is more reasonable. We have had no difficulties with the galvanocautery.

I am familiar with the advantages of the endothermic current in general surgery, and I use it extensively in operative procedures on the lung. In certain instances it has a decided advantage over the galvanocautery. In the operation of pneumolysis, whichever type of instrument we use, we still have the dangers of opening cavities that are prolongated in the adhesion, and we have the danger of hemorrhage because I do not believe that even the endotherm will entirely obviate this possibility. Personally I have had no experience with serious hemorrhage and the cases are fortunately rare even in the extensive series reported in the literature. A sizable intercostal artery which has been pulled down into a loop by the adhesion will present a very real problem if it is cut either with the endotherm or the galvanocautery.

One other danger that is possible in the use of the endotherm, that perhaps is obviated by using the galvanocautery, is in the cutting of adhesions close to the heart. The endothermic current causes a very vigorous muscle contraction when used in general surgery, and I should hesitate to use that type of current in the region of the vagus nerve or in the region of the heart. There have been certain cases reported in major intrathoracic operations involving the use of endothermy near the hilum of the lung in which sudden death has occurred presumably from the action of the high frequency current on the cardiac muscle.

CHAIRMAN TROWBRIDGE: Is there any other person who would like to discuss this paper? If not, Doctor Stivers will close.

DOCTOR STIVERS: The disadvantage of using the cutting endotherm in place of the cautery in severing adhesions close to the chest wall, is a very definite shock to the patient because of the formation of an arc in front of the electrode, when the endotherm is applied to the adhesion. There is also a definite shock to the tissues when the endotherm is withdrawn from the adhesion. The endotherm to cut properly must be held a minute distance from the parts to be severed. The galvanocautery applied at the area of coagulation can be thrust into the tissue and the band cut without any shock. This shock is very annoying to the patient, and that is the reason why the procedure proposed by Maurer is used at the Belmont Hospital and is preferred at times to cutting by the endotherm. There are some cases where one can use the cutting endotherm with decided advantage, but the coagulating endotherm with the galvanocautery is the procedure most generally used.

Meeting adjourned.

THE ABUSE OF JEWISH PHYSICIANS

A dispatch to the *New York Times* of August 19 states that tightening restrictions against Jewish physicians have been issued by Dr. Wagner, "Nazi Commissar." These are that "Aryan" doctors are forbidden to transfer patients to Jewish physicians, and to any but purely "Aryan" hospitals and sanatoria. Jewish specialists may not be called in consultation but "Aryan" physicians in case of need may take over cases from Jewish practitioners.

The number of physicians who cannot qualify as "Aryans" is large and they are threatened with loss of a living revenue.

Other conditions seem to indicate a bitter and relentless opposition to the Jewish people. Evidently there is no Bill of Rights in Germany for the Jewish physician.

MORTALITY RATES

Telegraphic returns from 85 cities with a total population of thirty-seven million for the week ending August 12, indicate a mortality rate of 9.2 as against a rate of 9.4 for the corresponding week of last year. The highest rate (15.5) appears for Trenton, N. J., and the lowest (4.6) for South Bend, Ind. The highest infant mortality rate (18.2) appears for Nashville, Tenn., and the lowest for Bridgeport, Conn., Des Moines, Ia., Erie, Pa., Fall River, Mass., Long Beach, Calif., Peoria, Ill., San Diego, Calif., and Somerville, Mass., which reported no infant mortality.

The annual rate for 85 cities is 11.2 for the thirty-two weeks of 1933, as against a rate of 11.5 for the corresponding period of the previous year. —*Bureau of the Census.*

A RESUME OF SOME PHYSIOLOGICAL REACTIONS TO HIGH EXTERNAL TEMPERATURE*

BY A. V. BOCK, M.D.,† AND D. B. DILL, PH.D.†

AS a part of the program of the Fatigue Laboratory of Harvard University, a temporary laboratory was set up at Boulder City, Nevada, during the summer of 1932, for the investigation of certain physiological responses of man to conditions of extreme heat. Boulder City is in a Federal Reservation which includes the site of Hoover Dam now being built across the Colorado River in the Black Canyon region of the Colorado Basin, a desert area subject to high daily temperatures throughout the summer months. Our investigations were authorized by Ray Lyman Wilbur, then Secretary of the Interior, and Mr. Elwood Mead, Commissioner of the Bureau of Reclamation, and received the cordial interest of the officers of the Bureau and of the engineers in charge of construction of the dam.

The laboratory occupied a portion of the basement of the Municipal Building in Boulder City, about seven miles from the dam-site. We were also given ample opportunity for observation and necessary work at the dam, and through the coöperation of Dr. Wales Haas were able to study patients in the hospital operated by the Six Companies Construction Company. We were fortunate also in securing the coöperation of a number of the workmen for special study.

Although the data obtained are now in process of publication in a series of papers, it has seemed desirable to present a less detailed summary of the work for the reader who may not be interested in analytical results.

A review of the literature with reference to the effects of heat upon the body of man indicates a dearth of quantitative chemical data. Early interest has been manifested in the subject. Blagdon and Fordyce[1], for example, in 1775, demonstrated that a healthy man could withstand for a period of fifteen minutes an exposure to a dry atmosphere of 250° F. without ill effects, while a beefsteak exposed to the same temperature was cooked in thirteen minutes. Many observations have been made since then and speculations have been rife as to the means by which the body meets or succumbs to extreme environments of heat. Emphasis has been laid in the literature upon the identification and theories of the mechanism underlying such states as sunstroke, heat stroke, heat prostration and heat cramps. Good clinical descriptions of these conditions have long been available, as well as anatomical findings in some of them. In recent years the belief has been growing that excessive loss of salt from the body is the cause of heat cramps, but exact data have been wanting. With the exception of heat cramps it is not proposed in this paper to discuss these dramatic episodes resulting from heat, but instead to consider some of the means by which the body reacts in adjusting itself to high external temperatures.

It is common knowledge that hard physical work may be maintained for many hours if the external temperature and humidity are low and especially if there is good wind movement. Under these conditions the increased rate of heat production by the body is met by an increased rate of heat dissipation, and the internal temperature remains relatively constant. If, however, the external conditions are sufficiently unfavorable for heat dissipation, body temperature will rise and lead early to a state of physical exhaustion. Under such conditions Dill and others[2] have shown that the heart rate rapidly reaches a maximum, bringing with it immediate exhaustion, except possibly in the case of a highly trained athlete. Exhaustion under these circumstances occurs when the rate of work done is not great, and suggests that the ability to carry on is limited by excessive fatigue of the heart muscle itself. The heart rate increases with the external temperature even though body temperature may have changed but little, and it is conceivable that such a response may lead to death independent of the phenomena conventionally described in connection with heat stroke.

In the desert when the shade temperature was 40° C. and the humidity about 20, a work experiment including as subjects a man and a dog was carried out to test the comparative heat dissipative mechanisms of man and dog.[3] The subjects walked 3.2 km. down a 5 per cent grade, returning over the same route, the round trip requiring about 70 minutes. The dog made four such trips, a total distance of 26 km., and the man five, or a total distance of 32 km. The dog became exhausted, his body temperature rising to 41.5° C., while the man finished in good condition. A record of the water intake throughout the day was made, and observations made on body weight, blood changes, temperature fluctuations, etc. The man lost 3.1 kgm. in weight, the weight of the dog remaining fairly constant. The difference in weight response is related to the large amount of salt lost in the sweat of man, as opposed to a small salt loss in the case of the dog,—that contained in the sa-

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liva dripping from his mouth. Taking into account the total water intake of the man plus his net loss of weight we find that the man evaporated approximately twenty pounds of water during his walk in a period of about seven hours. The dog probably evaporated more water per pound of body weight than the man, but notwithstanding this could not prevent a substantial rise in body temperature. The heat dissipative mechanism of the dog failed because his skin absorbed heat in view of the excessive heat of his environment. Air movement and low humidity kept the man's skin cool, while the former favored heat absorption through the dog's skin. A calculation of the energy output for the man during this experiment indicates an expenditure of about 2000 kgm.-cal., an effort which would have been impossible had the humidity been high as well as the temperature.

Numerous analyses of the blood of both subjects showed that the serum chloride concentration remained relatively constant. In the case of man this result is obtained at the expense of tissue salt, and the total weight loss is chiefly due to salt lost from the body in sweat. It has been established by Cohnheim, Kreglinger and Kreglinger[4] that a healthy subject does not retain water without salt. As sweating takes place, one drinks only enough water to maintain the sodium chloride concentration near the normal value. The body weight is not regained until the salt debt is paid. Unless a high salt intake is maintained under conditions in which profuse sweating occurs, serious consequences may develop as shown by the study of heat cramps made by Talbott and Michelsen[5].

In an experiment carried out in Boston at a temperature of 20° C. calling for an expenditure of approximately the same amount of energy, the dog proved to be superior to the man. This dog's capacity for work at 40° C. is less than one third that at 20° C. During exercise the dog is able to dissipate a far larger proportion of heat from his lungs than is the case with man, and this of course is accomplished by placing no additional burden upon the circulation. In man the dissipation of heat from the skin requires a shunt of a large amount of blood to this area, which places the main burden of gas transport upon the remainder of the circulation. In the laboratory the dog also furnishes his own air circulation more effectively than man.

Five cases of heat cramps were studied in the hospital at Boulder City. The one striking finding in these cases was the reduction of serum chloride concentration, brought about by excessive sweating and inadequate intake of salt. In every case, within a few hours after intravenous salt solution was given complete relief from muscle cramps occurred. Numerous theories concerning the cause of heat cramps appear in the literature, but the data obtained with reference to serum chloride concentration in these five cases constitute the first determinations of which we are aware and little doubt now remains as to the cause of muscle cramps, occurring when the temperature is high and accompanied by rapid loss of salt in sweat.

We had no opportunity at Boulder City to observe cases of heat stroke, but there appears to be little doubt that the underlying mechanism in this condition is quite different from that involved in heat cramps. Prostration and death may occur before the acid-base equilibrium is seriously disturbed.

The prevention of heat cramps requires good daily hygiene, including adequate sleep, and a balanced diet containing enough salt to permit an output of at least three grams of salt in the urine daily. An intake of fifteen to twenty grams of salt per day may be necessary, depending upon the volume of sweat. In addition to salt in the diet, extra salt may be obtained by drinking water containing 0.1 to 0.25 per cent of sodium chloride or by ingesting salt in enteric-coated tablets, each tablet containing one gram. The latter is a simple and satisfactory method. There is probably a close connection between the level of salt in the blood and the sensation of thirst.

The composition of sweat has been the subject of a number of laboratory studies. The results appear to vary with the method of collection but tend to run high in sodium chloride and lactic acid. Fishberg and Bierman[6], for example, found 70 to 85 m.-Eq. of sodium chloride and high concentrations of lactate. No data, however, have been found in the literature as to the nature of sweat produced day after day in a sustained high temperature. The only practical way of making such a study is to determine the sweat volume by difference between water intake and urine output with subjects on a constant diet[7]. The water of foods and of combustion is practically offset by the water lost in insensible perspiration, the water lost in expired air and the water in the feces, an amount in all approximating one liter per day.

For the purpose of studying the composition of sweat, three subjects spent ten days in a moderate temperature at La Jolla, California. They were on a constant diet and a record was kept of water intake, body weight and urine output. The normal urinary output of water, chloride, sodium, potassium, nitrogen and inorganic phosphate was established at La Jolla. At Boulder City the decrement in urinary output of these substances due to sweating was found, the sweat volume was estimated from water intake and urine volume, and the concentrations in sweat were calculated. Later three additional subjects were studied. This method as a whole for the study of the composition of sweat was reasonably accurate because of the faithfulness with which the diets were maintained, the duration of the experiments, the large volumes of sweat and the rel-

atively large deficits in the urine of significant substances.

The results indicate perceptible variations in the composition of sweat from individual to individual, but the concentration of chloride rarely exceeded 20 m.-Eq. In the case of S. A. O. the chloride concentration is less than half that of D. B. D. For other details of the analyses, reference should be made to the original paper. It is clear that sweat produced in a hot climate is much more dilute than might be inferred from most of the previous data, but this might have been expected in view of the natural tendency of the body toward conservation. The volume of sweat in the various individuals varied from 2 to 7.5 liters daily. Variations were found in the concentration of potassium as well as chloride, and the excretion of lactate was found to be quite small.

The mechanism by which the output of substances in the sweat is regulated is unknown. One important aspect deserves mention. Clear evidence was found that in the process of acclimatization to a high temperature the concentration of salt in sweat decreases. The same phenomenon is suggested with reference to nitrogen in the case of S. A. O. In twenty days this subject had a total nitrogen deficit of 32 grams, of which 8.8 grams was accumulated in the first two days in Boulder City. From these findings it seems likely that salt loss in a hot climate may be maximal in the first three or four days during which the salt intake should be increased. The same precaution should be taken after a short absence from a hot environment due to the rapid loss of such an adaptation. After acclimatization, sweat is so dilute that 10 liters a day may be secreted without necessitating an intake of more than 15 grams of salt daily.

Of great practical importance is the result of a study by Talbott and others[8] on fifteen of the Hoover Dam workmen. In addition to a past history of adaptation to climatic changes, observations were made as to present adjustment to the high temperature of Boulder City and the still more trying conditions at the dam-site. Detailed studies were made on the blood and urine both before and after work, the data of which need not be analyzed here. They indicate a very satisfactory adaptation to withstand hard physical work under conditions in which the shade temperature often reached 45° C. and the temperature of the rocks and sand reached 55° to 60° C.

In the summer of 1931, when the work on Hoover Dam was getting under way, a number of deaths occurred among the workmen and others in the area, and there was a high incidence of heat prostration. In the summer of 1932, no deleterious effects from heat were encountered among about 3000 workmen other than a very few cases of heat cramps. Although the daily temperatures of the summer of 1931 exceeded those of 1932 the significant difference in the response to heat in these two periods appears to be due to the change in living conditions. In 1932 housing conditions were excellent, the dormitories being air-conditioned, cool drinking water was available, the food supply was better than ever hitherto offered to a large construction crew, and for diversion, recreation rooms and a moving picture theater were freely used. In effect an oasis has been made in the desert, the comforts of which have made hard work possible without detriment from extreme heat.

The crew of the Fatigue Laboratory are indebted to Mr. Bechtel, Mr. Crowe and Mr. Gallison of the Six Companies, Inc., and to Mr. Walker Young and his associates of the Bureau of Reclamation for their unfailing courtesy. The magnitude of the work they have undertaken and the spirit with which they are doing it can be appreciated only by a visit to Boulder City.

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SOME UNDESIRABLE TENDENCIES IN USING AN ETIOLOGICAL CLASSIFICATION OF HEART DISEASE*

BY HENRY A. CHRISTIAN, M.D.†

NO one would question the advantage in knowing the cause of any disease. The determination of etiology often is the most important step toward vastly better methods of treatment and prevention. Still long periods of time may, and often do, elapse between the discovery of the etiology and any real improvement in either the treatment or prevention of the disease whose cause has been discovered. Whereas it is advantageous, whenever possible, to utilize etiology in the classification of a given disease, an etiological classification may not greatly help the situation, especially if it is al-

*Some summer reflections.

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lowed to replace other criteria of classification; in fact, under these circumstances it may actually prove a detriment. It seems to me that something of this sort is developing from the present very extensive use of an etiological classification of disease with a tendency to give up, to a considerable extent, any anatomical basis of classification. At least, as I talk with my colleagues particularly interested in cardiology and query medical students, I very definitely gain the impression that this is true for heart disease.

In recent years great forward strides have been made in our knowledge of both etiology and function of many disease conditions, and these advances have been applied to the care of patients with very definite improvement in their management. Perhaps with the vast amount of knowledge available to the student of disease, it is not surprising that, with increase in our knowledge of etiology and function, there should be a tendency to neglect the facts which have been derived from a study of anatomy and pathology. Certain it is that the vast majority of the clinicians of today, particularly those under 60 years of age, have, with few exceptions, a far less effective working knowledge of anatomy and pathology than did their predecessors and so are not in a position to utilize very well that knowledge in their study of patients. This seems to be true both for internal medicine and for surgery. Would it not be better, were more hours, than at present, spent in the laboratory of pathology, and particularly in the performance of autopsies and the study of specimens removed in the operating room, by those training themselves to become clinicians? It seems to me that this is so.

As concerns heart disease, there seems no reason why all of what has been learned of late in regard to etiology and function should not be utilized in our classification, study and management of patients while, at the same time, making use of all of our anatomical and pathological knowledge both of the past and more recent years. In other words diagnosis and treatment can be based at the same time on etiology, function and structure, with a definite advantage over utilizing any single one of these.

If one critically reviews an etiological classification of heart disease, one can but question whether it has added materially to our effectiveness in the managements of patients with heart disease. To make a diagnosis of rheumatic heart disease, for example, does not really help any in the treatment of the patient. To say hypertensive heart disease is, in fact, not making an etiological diagnosis, though such it may seem to be, because until we know the cause of hypertension, we can know but little of what causes so-called hypertensive heart disease, and after all, it is very probable that some unknown factor has to enter in to produce cardiac failure even in the presence of hypertension. Much of this applies to arteriosclerotic heart disease, too, to use another term in the etiological classification. These three, rheumatic, hypertensive and arteriosclerotic heart disease, constitute a very large proportion of the patients who come to us for treatment, possibly as much as 90 per cent, in some clinics even 95 per cent.

Syphilitic heart disease is a very definite etiological type, and inasmuch as syphilis but rarely causes other than heart disease with aortic regurgitation, it is a very distinct entity; knowing its cause definitely gives a lead to part of the proper treatment, even though unfortunately in so many of these patients anti-syphilitic therapy influences very little the symptomatology and hardly more the progression of the lesion. Anyhow, the syphilitic cause of certain cases of heart disease has been recognized for a long time, even before an etiological classification of heart disease had replaced an anatomical one.

When we come to cardiac disease associated with thyroid disturbance, diagnosis of this relationship, i.e., an etiological diagnosis, definitely brings much help in treatment. Hardly any other etiological relationships than those just mentioned play any helpful rôle in managing patients with heart disease.

If we use the diagnostic term, rheumatic heart disease, there is a temptation to do one of two things, both making for a less complete knowledge of the condition in the individual patient than is either possible or desirable, and this temptation seems often not to be resisted today. One is tempted either to go no farther in diagnosis than to say rheumatic heart disease or to make a probable diagnosis of an anatomical condition of a given valve merely because with rheumatic heart disease sooner or later such a valve lesion almost always appears.

To me it seems definitely helpful in the management of a given patient with rheumatic heart disease to diagnose just what is the anatomical condition of the valve and the degree of deformity of its structure, as well as to know the general type of the cardiac lesion, as is expressed by the term, rheumatic.

The patient, for example, who has as the chief cardiac lesion one involving the aortic valve orifice causing its stenosis is definitely different in so many respects from one with the predominating lesion, mitral stenosis, and both so different from one with a marked degree of both mitral stenosis and aortic regurgitation, though all have a common etiology, rheumatism, that knowledge of these anatomical conditions, which fortunately can be obtained by the methods of physical diagnosis, is of much help in their clinical management.

To me it does not connote great clinical acumen to make a diagnosis of aortic stenosis and mitral stenosis and then find on postmortem study a markedly narrowed aortic orifice and at the mitral valve only a slight degree of thickening of the cusps with a little interadherence of the valve sails. Such a diagnosis has been based on finding the well-developed physical signs of aortic stenosis and the very questionably suggestive evidences of mitral stenosis, the diagnosis of mitral stenosis actually having been based on the knowledge that the patient has had in the past an attack of rheumatic fever and so has the probability of having mitral stenosis. However, had there not been the aortic stenosis, the patient's heart would have continued to have functioned effectively for many years to come; the significant lesion was aortic stenosis due to rheumatic fever, and this concept should be expressed in the diagnosis, and in addition, were there sufficient evidence in physical signs, slight degree of mitral stenosis, not sufficient to disturb cardiac function, justifiably should appear in the diagnosis. It is such refinements of diagnosis, which tend to be lost at present in the utilization of an etiological basis of classification, and which can, and should be, retained if both etiology and structure remain as criteria of classification and so of the determination of what diagnostic terms to use. Possibly it is just this attitude toward diagnosis, which has delayed until so very recently the recognition that aortic stenosis with practically no lesion of any other valve and usually accompanied by extensive calcification is not only a distinctive clinical entity but one of considerable frequency of occurrence and easy of diagnosis, notwithstanding the statement still usually found in the books that it rarely occurs and is not often correctly diagnosed.

In my opinion the diagnosis should express all that may be learned from the study of the patient both as to the etiology and the pathological anatomy of the lesion. The extreme of the tendency in this other direction is found in the use of the term, congenital heart disease, which is an etiological term, with no attempt to express the anatomical relations; unfortunately to diagnose "congenital heart" is as far as many clinicians attempt to go. Actually in most patients with congenital heart lesions a very accurate *intra vitam* diagnosis of the anatomical changes can be made by those familiar with the literature who have studied carefully their patients and checked their clinical conclusions by postmortem examination.

If clinicians of today were as diligent as their outstanding predecessors have been in seeking permission for postmortem examination of the patients whom they have followed in their illnesses, and actually studied their organs, they would make better anatomical diagnoses, which, interpreted in the light of more recent knowledge of etiology and function would give them a very helpful understanding of their patients' disease and its management.

PERNICIOUS ANEMIA: A CONDITIONED DEFICIENCY*

Observations On The Effects of The Administration of A Substance Rich in Vitamin B Complex

BY JOSEPH E. CONNERY, M.D.,‡ AND LEONARD J. GOLDWATER, M.D.‡

INTRODUCTION: The literature covering the work of Castle and his associates which led to the formulation of the hypothesis that "Addisonian pernicious anemia, the macrocytic anemia of the tropics, of sprue and of coeliac disease are due, in common, to the lack of a specific hematopoietic reaction between an extrinsic factor (vitamin B_2) and an intrinsic factor of the normal human gastric juice" is readily available, and has recently been reviewed by Strauss and Castle[1]. Therefore this material will not be given in detail in our paper. According to Castle[1], the above-mentioned reaction is absent in Addisonian pernicious anemia "mainly because of a lack of the intrinsic factor". As pointed out by Castle and his collaborators (based on the hypothesis stated above) one or more of three possible mechanisms may operate in the production of Addisonian pernicious anemia: (1) lack of the intrinsic factor, (2) lack of the extrinsic factor, (3) failure of absorption (or utilization) of the resultant of the interaction of the intrinsic and extrinsic factors. The purposes of the work reported in this paper are as follows: (a) to adduce evidence as to the validity of the third postulate stated above; (b) to study the hematologic effects of the administration of a substance rich in vitamin B complex† on patients with Addisonian pernicious anemia.

Materials and Methods: The patients included in this study were classical cases of Addisonian pernicious anemia, and represent the first five cases coming under observation after the study was begun. It is to be emphasized that these cases were not selected from a large

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†Vegex—a yeast autolysate.

group. All of the patients had absence of free HCl as determined by an alcohol test meal reinforced with subcutaneous injection of histamine. The source of the vitamin B complex used in the study was Vegex, a commercial yeast autolysate especially rich in B_2. Pooled samples of gastric juice obtained from normal individuals after the injection of histamine were used as a source of the intrinsic factor. This juice was treated in no other way than by simple filtration to remove coarse particles. As a source of vitamin A, a concentrate of cod liver oil* rich in A and D, was used. The oral liver extract was a solution of fraction G of Cohn[2] of such strength that 10 cc. of the extract contained the material derived from 100 grams of fresh liver†. The parenteral liver extract was a solution of fraction G of Cohn[2] of which 3 cc. contains the material derived from 100 grams of liver†. The manner of administering the parenteral extract has previously been described in detail[3].

The diet of these patients during the period of study contained no liver, kidney or stomach, but did contain moderate amounts of cooked meat. No other medication or special articles of diet were given in addition to the substances being tested. Determinations of the reticulocytes were made daily, and the trend of the curve used as a criterion of hematologic response. Inasmuch as no fixed dosage or sequence of administering the various test substances was followed, the details of this part of the method will be given for each case in the charts.

CASE PROTOCOLS—CASE 1: C. P. Male, aged 60, nativity, U. S., marine engineer. Admitted in his fourth relapse, with a marked degree of combined system disease. R.B.C. 1.4 mil. Hb. 32.3 per cent, 5.5 Grams (Klett-Newcomer method, 17.0 G. per 100 cc. blood=100 per cent). C.I. 1.15, W.B.C. 3,100, reticulocytes 0.4 per cent. This patient had been given parenteral therapy in a previous relapse and had been discharged in a state of hematologic remission about eight months previous to the present admission. He failed to report to the return clinic as instructed, but was quite emphatic in claiming to have taken a fair amount of liver extract orally, and whole liver. In view of what followed one can readily understand how the patient might have relapsed while taking oral therapy. For treatment and hematologic response see chart 1.

*Prepared by the Health Products Corporation, Newark, N. J.
†Prepared by the Lederle Laboratories, New York.

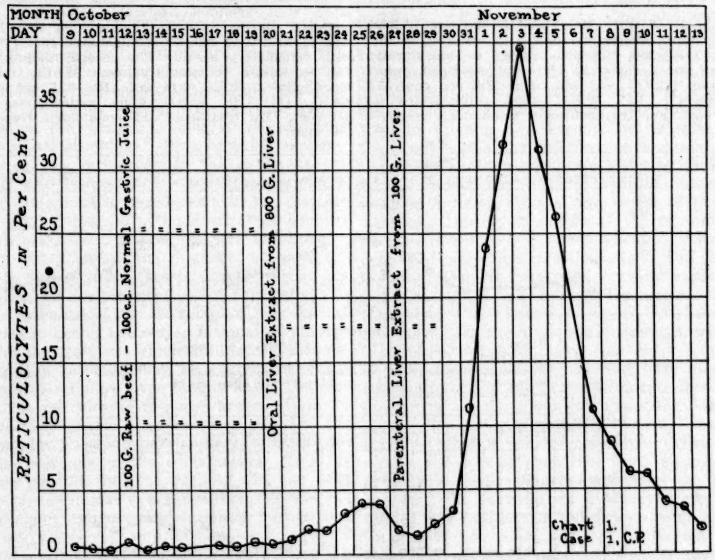
MONTH
October
November
DAY
9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13
RETICULOCYTES IN Per Cent
35
30
25
20
15
10
5
0
100 G. Raw beef + 100 c.c. Normal Gastric Juice
Oral Liver Extract from 600 G. Liver
Parenteral Liver Extract from 100 G. Liver
Chart 1. Case 1. C.P.

CHART 1.

Chart showing curve of reticulocytes in case 1. No response from raw beef plus normal gastric juice, only slight response to large amounts of liver extract by mouth, but prompt and marked response to liver extract intramuscularly.

CASE 2: T. H. Male, aged 43, nativity, U. S., plasterer. Admitted in his first relapse, with symptoms primarily related to the anemia and gastrointestinal tract. There was very little neurologic involvement. R.B.C. 1.7 mil., Hb. 32.7 per cent, 5.6 G., C.I. 0.95, W.B.C. 3,700, reticulocytes 4.5 per cent. The patient gave no history of having eaten liver or taken liver extract prior to his admission to the hospital. For treatment and hematologic response see chart 2.

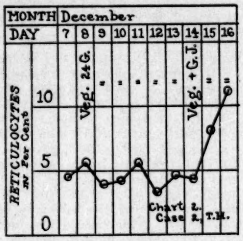

CHART 2.

VEG 24 G = Vegex 24 G.
VEG = 6 G Vegex.
G J = Normal Human Gastric Juice 50 cc.

Chart showing curve of reticulocytes in case 2 during administration of vegex, and vegex plus gastric juice. For interpretation see text under "discussion."

CASE 3: J. O'H. Male, aged 40, nativity, Ireland, occupation, laborer. Admitted in his first relapse with symptoms referable chiefly to the anemia. There was a moderate degree of combined system disease. R.B.C. 0.89 mil., Hb. 22.4 per cent, 3.8 Grams, C.I. 1.31, W.B.C. 2,000, reticulocytes 0.9 per cent. For treatment and hematologic response see chart 3.

CASE 4: P. L. Male, aged 50, nativity, Italy, fruit dealer. Admitted in first relapse with complaints referable chiefly to the anemia. R.B.C. 1.8 mil., Hb. 35.5 per cent, 6.0 G., C.I. 0.99, W.B.C. 8,000, reticulocytes 1.4 per cent. For treatment and hematologic response see chart 4.

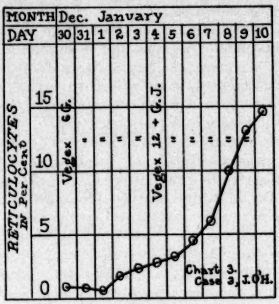

CHART 3.

VEG 12 = Vegex 12 G.
G J 100 = Normal Human Gastric Juice 100 cc.

Chart showing curve of reticulocytes in case 3. Note two distinct gradients in curve. For interpretation see text under "discussion."

CASE 5: M. B. Male, aged 43, nativity, U. S., occupation, steamfitter. Admitted in second relapse with symptoms referable chiefly to the anemia. During his first relapse he had been treated with liver extract administered parenterally with satisfactory result. The second relapse was due to failure to take treatment at the return blood clinic. R.B.C. 1.15 mil., Hb. 26.7 per cent, 4.0 G., C.I. 1.21, W.B.C. 6,300, reticulocytes 1.5 per cent. For treatment and hematologic response see chart 5.

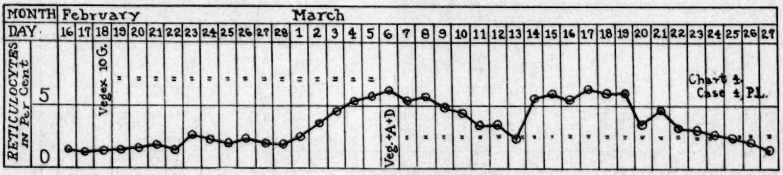

CHART 4.

VEG + A & D = Vegex 10 G. plus 12 Cod Liver Oil Concentrate Tablets.

Chart showing curve of reticulocytes in case 4. Note two distinct periods of increased reticulocytes. For interpretation see text under "discussion."

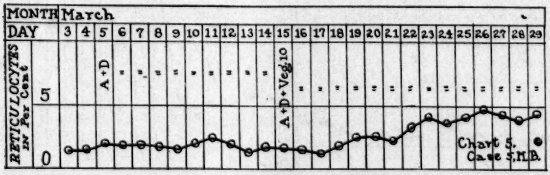

CHART 5.

A + D = 12 Cod Liver Oil Concentrate Tablets.
VEG 10 = Vegex 10 G.

Chart showing curve of reticulocytes in case 5. No response from vitamin A (A + D). Slight but definite response following addition of vegex.

DISCUSSION: Case 1 is cited to prove that failure of absorption as a conditioning mechanism (postulate 3 above) does actually occur. The fact that failure of absorption can and does occur is of great importance in interpreting the results in the other cases reported in this paper. Inspection of chart 1 shows that oral administration of raw beef plus normal human gastric juice over a period of eight days was without effect. Further, the oral administration of a known potent solution of fraction G derived from large amounts of liver (800 G.) induced a reticulocyte response of a magnitude which was negligible, considering the amount of extract given, and the level of the red cells at the time (about one million). Finally, the parenteral (intramuscular) administration of a solution of fraction G derived from 100 G. of liver on each of three successive days produced a reticulocyte response characteristic of this type of therapy, namely, prompt and maximal. From this it would seem that failure to respond either to the combination of beef and gastric juice, or to large amounts of a potent liver extract given by mouth, can be explained only on the basis of failure of absorption from the gastro-intestinal tract. We can now understand why this patient relapsed while taking oral therapy as the only form of interval treatment.

In case 2 the occurrence of a reticulocyte peak of 11.6 per cent can be explained in one of two ways: 1. the B complex alone was a hemopoietic stimulant and initiated a hematologic response; 2. the B complex reacted with intrinsic factor present in the stomach to elaborate the resultant hemopoietic stimulant. Both of these explanations are at variance with the experience of Castle who states that he has found autolysed yeast alone inert in pernicious anemia. He further states that in patients with Addisonian pernicious anemia in relapse there is failure to carry out the essential reaction between extrinsic and intrinsic factors due to lack of the latter. The delayed response of this patient to large amounts of the B complex may be explained in one of two ways: 1. impaired absorption of the substance which stimulates hemopoiesis, 2. the response may be characteristic for vitamin B complex given in this way. The fact that the reticulocyte response began within 24 hours after gastric juice had been added to the B complex makes it quite unlikely that the response was due to the combination. It is of course possible that the peak of 11.6 per cent may have been due to a summation effect of extrinsic plus extrinsic and intrinsic factors, but this also seems very improbable.

Inspection of chart 3 (case 3) shows that the curve of the reticulocytes has two distinct gradients, the first of these beginning on the fourth day of treatment and the second on the ninth day. We interpret the first rise as a response to the administration of the B complex. The second, and more acute, gradient is interpreted as representing the response of the reticulocytes to the administration of normal gastric juice (intrinsic factor) in combination with B complex (extrinsic factor) or the effect of the resultant of their interaction. As in case 2, the first phase of the reticulocyte curve can be explained in one of two ways: (1) the B complex of itself is the hemopoietic stimulant, or (2) this patient, a case of Addisonian pernicious anemia in relapse, must have had some intrinsic factor present. On the other hand, the gradient of the second phase of the reticulocyte curve, the height of the peak and time of occurrence of the peak are not of the type seen when B complex alone is administered. Therefore it would seem reasonable to ascribe the sharp rise in the number of reticulocytes to the combined effect of B complex and gastric juice, or more probably the effect of the resultant of their interaction.

In case 4, as in cases 2 and 3, a reticulocyte response occurred during the administration of B complex. The possible explanations of this response are the same as in cases 2 and 3. Under the conditions which prevailed, the reticulocyte response to the test substance used was maximal. In addition to the signs and symptoms of Addisonian pernicious anemia, this patient presented certain findings suggestive of Vitamin A deficiency. In view of the findings of Wolbach and Howe[4] of keratinization of mucous surfaces including the gastro-intestinal tract in Vitamin A deficiency, and in view of the possible resulting interference with absorption of anti-anemic substances given by mouth, it was deemed advisable to institute intensive vitamin A therapy* as a supplement to the B complex. During the course of the vitamin A administration there occurred a second reticulocyte rise, comparable in magnitude to, and more sustained than, the first rise. Several explanations of the second reticulocyte rise suggest themselves: (a) vitamin A (A + D) of itself may have been the hemopoietic stimulus, which explanation seems unlikely (see chart 5, case 5); (b) the second response may have been a rise secondary to the first reticulocyte increase due entirely to the administration of the B complex. This occurrence would be entirely contrary to what is usually observed[5]. That the second rise was of about the same magnitude as the first, that it occurred soon after the first, and that the curve shows a sustained rise all render this explanation quite improbable. (c) Vitamin A (A + D) may have enhanced the absorption of the B complex, thereby making more of the B complex available. (d) There may be some explanation of the phenomenon

*Cod Liver Oil Concentrate Tablets, prepared by the Health Products Corporation, Newark, N. J.

which is not apparent to us at the present time.

In view of the results observed in case 4, and because of the possibility that vitamin A (A + D) might of itself act as a hemopoietic stimulant, case 5 was treated first with vitamin A (A + D) alone. As may be seen in chart 5, there occurred no increase in the number of reticulocytes. When, however, the B complex was added, there followed a reticulocyte rise of the type seen in the other cases of this series. That vitamin A (A+D) was without effect upon the reticulocytes, and that the response following the administration of the B complex was not greater may have been due to failure of absorption of vitamin A (A+D) itself, or of the B complex. This question will probably remain a problem until a suitable preparation of vitamin A is available for parenteral administration.

Davidson[6] in an attempt to demonstrate whether vitamin B complex is the antianemic factor contained in liver and liver extract treated a series of patients of various types of anemia (including Addisonian pernicious anemia) with marmite. Marmite, as described by Vaughan and Hunter[7] "is a complex substance prepared commercially from yeast. It contains, therefore, all the constituents of the vitamin B complex". Davidson concluded that vitamin B is not the antianemic factor contained in liver or liver extract. We do not feel that the evidence adduced in the article quoted warrants the conclusions drawn by the author. The case of pernicious anemia illustrated in figure 1 of Davidson's article was treated first with marmite orally and later with liver extract parenterally. The marmite was without effect, and the parenteral liver extract produced a typical reticulocyte response. Inasmuch as the effect of oral liver therapy was not tested, one cannot be sure that the failure to respond to marmite was not due to failure of absorption rather than to lack of effectiveness of the B complex. His case 4 was treated first with marmite and later with liver extract orally. At the time when the liver extract therapy was started, the gradient of the reticulocyte curve was definitely on the way up. Further, the peak of the reticulocyte curve was reached four days after oral liver extract therapy was begun and marmite was stopped. A reticulocyte peak occurring at this time under this form of therapy may very well have been a result of the previous marmite administration. In addition, the type of reticulocyte curve in this case is similar to that seen in our own patients who received the B complex.

Vaughan and Hunter[7], in reporting two cases of celiac disease associated with megalocytic hyperchromic anemia successfully treated with marmite, state that Addisonian pernicious anemia is unaffected by marmite. The only evidence they offer to support this conclusion is a reference to the article by Davidson which we have just discussed. Wills[8], on the other hand, found that marmite was equally as effective as liver extract in the treatment of tropical macrocytic anemia with or without pregnancy.

It has been pointed out in an earlier part of our discussion that our experience in giving vitamin B complex alone to patients with Addisonian pernicious anemia is not entirely in accord with the experience of Strauss and Castle who state that they have found autolysed yeast alone inert in pernicious anemia[1]. However, unpublished data on the effect of B complex given in combination with normal human gastric juice are entirely in accord with the results reported by these authors.

SUMMARY

1. Data are presented which show that, in Addisonian pernicious anemia, failure of hematologic response to oral liver therapy may be due to defective absorption.

2. In a series of cases of Addisonian pernicious anemia evidence is adduced to show that the oral administration of vitamin B complex alone may excite a reticulocyte response. Possible explanations of this response are advanced.

3. Two patients with Addisonian pernicious anemia were given vitamin B complex plus vitamin A (in the form of a concentrate of A and D). The implications of the rôle of vitamin A as an adjuvant in the treatment of pernicious anemia are considered.

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MEDICAL PROGRESS

PROGRESS IN PSYCHIATRY FOR 1932

BY KARL M. BOWMAN, M.D.*

THERE have been no very new or startling developments in psychiatry during the past year. Some progress has been made in the studies of teaching psychiatry in the medical schools of the country and in the classification of hospitals for mental diseases. No final reports have been issued from either of these studies. However, there have been several excellent articles on the whole problem of psychiatric education.

An article entitled "The Crisis in Psychiatric Education" by Franklin G. Ebaugh in the *Journal of the American Medical Association* for August 22, 1932, reviews much of the material obtained by the study made by the National Committee for Mental Hygiene on the curricula of the different medical schools. The great variation in the number of hours and the years in which psychiatry is taught is emphasized, as well as the difference in the material given in the courses. Ebaugh reports a definite trend toward the teaching of psychiatry in the clinical years. In such cases much less didactic instruction is given and much more actual clinical work. Ebaugh feels that there should be a much better integration of the teaching of psychiatry with the other branches of medicine and surgery. He proposes a provisional curriculum in which psychiatry is taught during all four years and in which special emphasis is laid upon the psychoneuroses. He also gives a very graphic picture of the attitudes of many of the members of the faculty of the different medical schools concerning such teaching of psychiatry. He points out that professors of medicine estimate that psychiatric problems are present in from two to seventy-five per cent of their cases; professors of pediatrics estimate ten to seventy per cent in their field. He also mentions various criticisms of psychiatry given by professors of other branches. The criticisms of the pediatricians are of particular interest, especially the suggestion that child guidance work should be carried on by the pediatrician without help from the psychiatrist. Apparently one third of the pediatricians take this view, whereas two thirds feel that there should be joint teaching by the pediatrician and the psychiatrist.

A second article "The Place of Psychiatry in Medical Education" by Ralph B. Noble in the *Journal for Mental Science* for October, 1932, presents much of the same material. Noble also discusses his work while clinical professor of psychiatry at Yale University in visiting the medical and surgical wards and bringing out the psychiatric problems in many of these cases. He points out that in the United States and Canada there are not more than five or six universities that give anything like adequate postgraduate instruction in psychiatry. He emphasizes the multiple factors in the causation of mental disease.

Franklin G. Ebaugh and R. A. Jefferson have an article in the *Journal of Criminal Law and Criminology* for January, 1932, entitled "Liaison Teaching of Psychiatry in Law Schools" in which they present some general material on the teaching of psychiatry in law schools and the work done by them at the Denver University Law School. They point out that only six out of seventy-three law schools from which information was obtained give any instruction in psychiatry, and seven more give courses in which there is some reference to psychiatric concepts; eight law schools were considering establishing such courses. Comments were obtained from sixty deans of law schools and only ten seemed to feel that psychiatry should be placed on the teaching schedule. For the past five years a course has been given to the second year class at Denver University. This consists of 22 hours, 12 of which are didactic lectures and ten of which are clinics at the Colorado Psychopathic Hospital.

Important advance in the government treatment of prisoners is related in an article by W. L. Treadway in the *American Journal of Psychiatry* for July, 1932, entitled "Medical and Psychiatric Services in Federal Penal and Correctional Institutions." Treadway points out that the United States Public Health Service has now been given authority to furnish all medical services to the federal penal and correctional institutions; this includes psychiatric work. This represents a great advance over allowing each institution to develop its own medical service independently. A discussion of the method of organization is given.

Another excellent article by W. L. Treadway entitled "Drug Addiction and Measures for Its Prevention in the United States" appears in the July 30, 1932 number of the *Journal of the American Medical Association.* In this article Treadway summarizes our present knowledge about this problem.

The installation of psychiatric wards in general hospitals and the closer linking up of psychiatry with general medicine have received considerable attention. Many of the articles published are somewhat similar in nature and emphasize the importance of such wards and discuss how they can be best used.

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W. F. Loring in the *Journal of the American Medical Association* for April 23, 1932, in an article entitled "Integration of Universities and State Hospitals in Handling Mental Diseases" feels that the establishment of a state hospital of 150 to 200 beds in connection with a general hospital related to a university is the ideal arrangement.

Of interest to the general practitioner are some of the following articles:

"The Psychiatric Problems and Responsibilities of the General Practitioner" by W. T. B. Mitchell in the *Canadian Medical Association Journal* for October, 1932.

In this article it is pointed out that too many times patients are told to take a vacation or a trip away from home with the vague idea that time will solve a situation, whereas it should be realized that many of the problems of patients are at an unconscious emotional level not amenable to ordinary persuasion. In most of these cases the proper treatment is a study of the underlying emotional factors.

E. Wittkower and H. Petow in an article entitled "Clinical Aspects of Bronchial Asthma and of Related Conditions: Psychogenesis of Bronchial Asthma, in *Zeitschrift für klinische Medizin*, January 22, 1932, give their conclusions from a study of a series of cases. They feel that it is possible that some cases of asthma may be produced by psychogenic factors without any physical predisposition, but agree that this has not been absolutely established. They feel that in the majority of cases there is a mixture of constitutional and psychological causes and that attention to such psychological factors is of importance.

A. J. Sullivan and C. A. Chandler in an article entitled "Ulcerative Colitis of Psychogenic Origin: Report of Six Cases" in the *Yale Journal of Biology and Medicine* for July, 1932, feel that mental trauma may be the essential factor in the production of many organic diseases including thyrotoxicosis, diabetes and asthma. They also feel that gastro-intestinal diseases may be closely related to emotional disturbances, and report six cases of chronic ulcerative colitis in which they feel that such was the case.

Ernest F. Wahl in an article entitled "Cardiac Manifestations of the Psychoneurotic State" in the *Journal of the American Medical Association* for June 18, 1932, points out how a life of chronic invalidism may be brought about by some simple reference to cardiac irregularity on the part of the family physician. He also discusses the treatment of functional disorders. He feels that stimulants are to be avoided, that sedatives may be desirable in the beginning but should be discontinued as soon as possible.

G. M. Underwood in an article entitled "Emotional and Psychic Factors in the Production of Gastro-Intestinal Diseases" in the *Texas State Journal of Medicine* for March, 1932, points out how emotional factors may predispose to gastro-intestinal disease. He discusses indications for considering a condition organic and feels that if examinations are negative a definite attempt should be made to get at possible psychological factors and treat them.

In a somewhat similar article entitled "Gastro-Intestinal Manifestations of the Psychoneurotic State" Russell H. Oppenheimer in the *Journal of the American Medical Association* for June 18, 1932, points out that the disappearance of the family physician who was in close touch with the life history and emotional problems of the patient has resulted in less attention to psychological factors, and he feels that more attention should be paid to such conditions. He discusses the mechanism by which the autonomic and central nervous systems, through the emotional life of the patient, are able to influence the gastro-intestinal tract.

An article by C. H. Sippe and J. Bostock in the *Medical Journal of Australia* for January 16, 1932, entitled "Bromid Intoxication" points out some of the facts that are worth emphasizing. They found that mental symptoms commonly occurred when there was a bromid content in the blood of 200 mg. per 100 cc. Bromids are quickly absorbed but eliminated very slowly. Many cases of bromid poisoning are overlooked by the general practitioner, particularly if no rash is present. These authors claim that it is important not to eliminate bromids too rapidly because an acute psychosis may be produced. They advocate the use of one dram of sodium chloride in water three times a day.

F. S. Modern in the *Medical Journal and Record* for August 17, 1932, in an article entitled "Insulin in Treatment of Chronic Morphinism" advocates the use of glucose and insulin in the treatment of morphinism and claims that symptoms are markedly reduced by the use of such treatment.

As regards any new theories or new methods in the treatments for the major psychoses, it may be said that nothing has been brought out of any great value. The theory of colloidal agglomeration and dispersion as an explanation for the manic-depressive and schizophrenic reactions as advocated by Bancroft of Cornell has found no confirmation in the reports published so far.

Further attempts to find an endocrine basis for mental diseases have been of no avail. There have been a number of reports of the use of the physiological standardized ovarian extract in involutional melancholia and other disorders of the menopause. While some beneficial results have been reported in certain cases, it appears obvious that the use of such extracts is not a

cure-all for mental conditions appearing at that time of life.

The theory of focal infections has received some attention. There have been a number of articles emphasizing the rôle of infections of the sinuses and certain writers feel that there is reason to believe that such a relationship does exist.

The July, 1932 number of the *Journal of Mental Science* is a special monograph number entitled "Sinusitis in Mental Disorder." This consists of an elaborate discussion of the theory, symptomatology, diagnosis and pathology of cases of mental disorder which are thought to be due to sinusitis. A series of 33 illustrative cases are given in some detail. Over 1,000 cases were examined during a period of five years at the Birmingham Mental Hospitals; 818 of these cases were " found to show evidence of nasal sinus infection". Of the 818 cases, 304 had sphenoidal sinus infection, 424 had ethmoidal sinus infection and 631 had antral infection.

Excellent results are claimed by the treatment of the sinus condition which allowed free drainage. Over fifty per cent of the cases were improved enough to be discharged and a large number of others showed improvement, both mental and physical.

The articles represent a serious attempt to prove the focal infection theory of mental diseases and cover over 150 pages. There are elaborate pathological studies, including colored plates, to help prove the thesis advocated.

Several articles have appeared discussing psychiatric work with children. Of particular interest is the article by Leo Kanner in the *American Journal of Orthopsychiatry* for October, 1932, entitled "Supplying the Psychiatric Needs of a Pediatric Clinic." In this article Kanner discusses his work as a psychiatrist working with the Department of Pediatrics at the Pediatric Clinic of the Johns Hopkins Hospital. This article, which is too long to abstract, is an excellent presentation of how such a relationship can be worked out.

Further studies in the use of sodium amytal, nembutal and carbon dioxide in the treatment of stupors and allied conditions indicate that there is definite value in such treatments although no one of these measures is to be looked upon as anything more than a part of the total treatment.

S. H. Epstein and George M. Lott in an article entitled "Lumbar Puncture in Psychotic Patients" in the *Journal of Nervous and Mental Disease* for December, 1932, point out the value of sodium amytal and nembutal in quieting disturbed patients preparatory to lumbar puncture. Furthermore, following the puncture, the patient is somnolent for from four to eight hours so that the unpleasant reactions following lumbar puncture are diminished.

In a fifty page article in the *American Journal of Psychiatry* for November, 1932, George W. Henry discusses mental phenomena observed in cases of brain tumor. This article is likewise too long to be abstracted, but is recommended to those interested in the subject.

A most comprehensive discussion of migraine by Henry Alsop Riley appears in the November, 1932 issue of the *Bulletin of the Neurological Institute of New York*. This article, which covers 116 pages, discusses all aspects of the problem. Riley concludes that there is a definite hereditary factor and that maternal inheritance is more frequent than paternal. He feels that there is some relationship to the inheritance of a tendency to migraine and a tendency to convulsive disorders. He finds that there is a close relation between the menstrual cycle and attacks of migraine in some individuals. He feels that the causation is still in doubt. "Allergy of one kind or another may set in motion certain trains of events, but allergy does not cause migraine." Similarly, he feels that various toxic factors may likewise serve as precipitating causes for attacks, but that we are still left in doubt as to the fundamental cause. The endocrine theory presents a possible explanation as yet unconfirmed. The vasomotor disturbances are likewise of great interest and require further study. He suggests that a study of the hydrodynamics of the cerebrospinal fluid circulation is a method of study which should be carried out. There is practically no autopsy material on the subject of migraine. He feels that such autopsy studies with particular relation to the hypophysis and the surrounding structures and of the vascular system might give us some clue. Nothing new in the way of treatment is brought out.

A book of particular value to the psychiatrist, but also of great value to all physicians, is entitled "Alcohol and Man." The editor is Haven Emerson, and two of the associate editors, Henry A. Christian and Reid Hunt, are Boston men.

This book represents one of the few really scientific presentations of the subject. In general it is presented in such simple language that the average intelligent layman can comprehend most of what is said. The book suffers somewhat from duplication of material, but it is at present the one worth-while source of accurate scientific material on this subject.

CASE RECORDS
of the
MASSACHUSETTS GENERAL HOSPITAL

ANTE MORTEM AND POST MORTEM RECORDS AS USED IN WEEKLY CLINICAL-PATHOLOGIC EXERCISES

EDITED BY RICHARD C. CABOT, M.D.
F. M. PAINTER, A.B., ASSISTANT EDITOR

CASE 19351

WEAKNESS OF THE EXTREMITIES IN A MAN OF SEVENTY-SEVEN

MEDICAL DEPARTMENT

First admission. A man of seventy-seven entered for the first time twenty-two months before his second admission complaining of weakness of the hands and legs of a year's duration.

A year before entry he had swelling of the ankles, later of the lower legs, with more or less pain. The swelling persisted. His skin became dry and scaly. He was drowsy and easily felt cold. His eyes watered a great deal. Seven months before entry his hands swelled and felt numb. During the winter—he entered in spring—his other symptoms increased. Six weeks before entry, following a cold, he suddenly became very deaf. During the year he had lost much strength, and now found it difficult to get about. In general he had felt pretty well except for severe constipation. He had perspired less than usual. The history was difficult to obtain and not complete.

The family history and past history are not significant.

Physical examination showed an extremely drowsy old man, yawning. The skin was scaly, dry, yellowish and very loose, showing evidence of marked loss of weight. The face was very puffy, especially about the eyes and forehead, and was pale, especially the lips and mucous membranes of the mouth and throat. The hair was scanty and thin. The eyes were small and watered readily. The tongue was thick, large and deeply furrowed. The chest was barrel shaped. The expansion was fair. The apex impulse of the heart was not seen or felt. The left border of dullness was 11 centimeters from midsternum, 3 centimeters outside the midclavicular line. The sounds were very distant and muffled, scarcely audible at the base, but of normal rhythm and rate. There were no murmurs. The artery walls were palpable and tortuous. The pulses were normal. The blood pressure was 145/90. The lungs were normal to percussion except for hyperresonance. The breath sounds were emphysematous and very distant. The abdomen was protuberant, tympanitic, soft, not tender. The liver was felt at the costal border. The fingers and hands were greatly thickened and spade-like. The lower legs, ankles and feet showed pitting edema. The pupils were normal, the reflexes normal except for general sluggishness. Vibration sense was normal in the arms but absent in the great toes and diminished in the tibiae, especially the right. The knee jerks and ankle jerks were almost unobtainable, but the arm reflexes were normal. Babinski and Kernig were negative.

The urine showed a very slight trace to the slightest possible trace of albumin at 4 of 16 examinations, white cells at 14, red cells at one, specific gravity 1.012 to 1.025. The hemoglobin was 60 to 47 per cent, the red cell count 2,620,000 to 3,700,000; slight to well marked anisocytosis, slight poikilocytosis, color normal, 0.2 to 1.9 reticulocytes at 8 counts; red cell measurements, median 8.0 μ, dispersion 1.3 μ; white cells 3,550 to 11,700, polynuclears 51 per cent. Hinton test negative. Non-protein nitrogen 48 to 40. Gastric analysis showed no free acid, total acid 10, 35, 10. The renal function was zero in fifteen minutes, 5 per cent in half an hour, no specimen in an hour; less than 5 per cent in two hours. The basal metabolic rate was −28, −39, −10, and at discharge 0.

An electrocardiogram on the fourth day showed normal rhythm, rate 60, left axis deviation, slightly inverted T_1, P-R interval .25 second. Another two weeks later showed partial auriculoventricular block, rate 70, low T waves in all leads, moderate left axis deviation.

The temperature was 96° to 101° with one rise to 104.4° with the chill. The pulse was 52 to 96. The respirations were normal.

X-ray examination showed arteriosclerosis and a very much enlarged and dilated heart.

After twelve days of thyroid treatment the patient showed marked improvement. The basal metabolic rate came down to normal, the skin was much smoother, the mental condition brighter, the deafness less. Pallor remained, and the blood picture was slow to respond to liver extract, showing no change in a week. At that time he had a chill with a temperature of 104.4°. Mild infection of a finger developed. After three weeks the anemia responded slightly to liver and iron. At discharge, seven weeks after entry, the basal metabolic rate was normal and the general condition excellent for a man of his age.

History of interval. The patient was so drowsy when he gave this history that the statements are wholly unreliable. He said he did well until a week before readmission, when he had a vague uncomfortable feeling radiating up over the stomach from the umbilicus when he lay down. He had some gas. He slept sitting up in a chair.

Records of the Outpatient Department show

that he was followed closely for the twenty-two months' interval. On thyroid and liver he continued bright and alert for a year and a half, the skin warm and soft. The hemoglobin came up to 89 per cent, the red cell count to 5,000,000. He had no complaints, and during a summer outing was able to do much walking and hunting. After a fall on the ice he was not so well; he had backaches, the skin was drier, the hands stiffer. The paresthesiae persisted to a slight degree.

Second admission. On examination he was slightly overweight, moderately orthopneic, pale and slightly cyanotic. The skin of the hands was brownish and atrophic, over the chest and legs scaling, dry and yellow. The sclerae were muddy. The tongue was large and slightly smooth. The speech was thick. There was dullness at the apices, with many fine and medium râles, more at the right front; increased voice and bronchovesicular breathing at the right apex posteriorly. The diaphragm was high on both sides in the back, with moist râles at the bases. The heart was enlarged to the anterior axillary line, 13 centimeters from midsternum, 4 centimeters outside the midclavicular line; the supracardiac dullness was 7 centimeters. The sounds were of poor quality. The heart was slowly fibrillating, with a small pulse deficit. There were no murmurs. An electrocardiogram showed auricular fibrillation, rate 60 to 70, considerable left axis deviation, index −20, angle +48°, inverted T wave in all leads, high resistance. The blood pressure was 140/86 at admission, falling to 100/60 the day before death. The peripheral vessels were all beaded and very tortuous. The abdomen was slightly distended. A smooth liver edge was palpable 5 finger-breadths below the costal margin. There was edema of the sacrum and marked edema of the ankles and lower legs. The feet were cold. The pulsation of the dorsalis pedis was poor.

The amount of urine was normal with frequent catheterization. The specific gravity of the urine was 1.014 to 1.022. There was a very slight trace to a trace of albumin at all of eight examinations, questionable bile once. The sediment was loaded with white cells at two examinations and showed 4 to 40 per field at the other six, red cells at seven, occasional granular casts at three. The hemoglobin was 75 to 85 per cent, the red cell count 4,180,000 to 4,480,000, the smear not unusual. The white cell counts were 6,500 to 37,600 to 11,200, polynuclears 72 to 91 per cent, all young forms two days before death. The non-protein nitrogen was 40 to 110.

The temperature was 95.4° to 103°, the pulse 60 to 111. The respirations were 20 to 40.

Thyroid was stopped and the patient was digitalized. On the third day his breath was ammoniacal, his breathing Cheyne-Stokes in type, he looked worse and was extremely dyspneic on the slightest exertion. During the next ten days he made remarkable improvement. On the sixteenth day however he had nausea, vomiting and pain in the left lower quadrant, somewhat relieved by an enema. That night he had a shaking chill and a white cell count of 37,600. The next day the pain and tenderness in the left lower quadrant were more marked. The urine was loaded with white cells. A surgical consultant found no tenderness in the kidney regions. He saw no indication for operation. The patient was put on constant drainage and was more comfortable the next morning, but in the afternoon had marked distention and in the evening vomited fecal material. A nasal tube was inserted for lavage and 74 ounces of fecal material removed from the stomach during the night. Next morning the distention was much less; nevertheless it persisted. The urinary output was very low. The non-protein nitrogen rose to 110. The patient grew steadily weaker, had râles at the bases, and three weeks after admission died.

Clinical Discussion

Dr. Maurice Fremont-Smith: Swelling of the ankles we associate first of all with cardiac decompensation, but we have no note as to dyspnea, which certainly should precede swelling of the ankles in cardiac failure, and we have here a description of pain, and pain is characteristically absent in the swelling from cardiac decompensation. Swelling and pain make one think of an arthritic situation or of some infection. The rest of the story suggests thyroid deficiency. He was drowsy, felt cold, his hands swelled and felt numb; even the deafness and loss of weight could go with a thyroid deficiency. On the other hand it is difficult to explain the actual swelling of the ankles and the pain, and it is also difficult to explain the very marked loss of strength on that basis. Usually patients with myxedema do not have such marked loss of strength.

Then we have the watering of his eyes. I wonder whether there is any glandular enlargement. The story might go best perhaps with one of the essential blood diseases, perhaps a leukemia, and that particular type of leukemia which involves the lacrimal glands. It would seem that some fundamental disturbance had taken place in this man that none of the suggestions that I have thrown out cover.

We have here the picture of an old man who has lost some weight. The watering of the eyes in a man of this age can be caused by an ectropion, that is, a separation of the lids from the conjunctivae, so that there is a constant stimulation of the conjunctivae by cold air. The interesting signs here are the thick, large, deeply furrowed tongue, the dry skin, the spade-like hands, and then these changes in sensory conduction.

Here is a picture of the old gentleman. He just looks like an old gentleman, not strikingly

emaciated although his collar is loose. His eyebrows are very fair, and as we see the hands in the photograph they are not remarkable for a man of seventy-seven. There is no particular swelling in the region of the lacrimal glands. It would be extremely interesting to have pictures of this man as a youth to compare. I think there is nothing here on which one can lay much stress.

We have, however, this absence of vibration sense in the ankles, and of course that goes with any condition that interferes with the peripheral nerves or the posterior tracts in the cord. The fact that he felt the tuning fork on his arms shows that he was able to recognize the vibrations. There are individuals who are so sluggish that they do not respond.

Has he a primary anemia? Has he a hyperchlorhydria? Has he a hypothyroid condition? Has he diabetes? I shall ask Dr. Mallory, but we have always been taught that diabetes can cause changes in the cord. It has always been in my mind that it might be a peripheral nerve and not a cord change. Of course he may have tabes. If these observations are correct there must be some changes in the cord.

His kidneys are able to concentrate still. There is nothing in the sediment which is not consistent with a man of seventy-seven without disease of the kidneys.

Two per cent of reticulated cells is somewhat high for a normal blood but not characteristic; 8 μ is above the normal, but the mere fact of finding the average red cells larger than normal in volume does not make a diagnosis of pernicious anemia. One can have that condition in any situation in which the bone marrow is much interfered with and in which for some reason larger cells than normal are being formed, in myelogenous leukemia for instance, and we cannot make a diagnosis of pernicious anemia on that fact alone. I do not know what normal dispersion is.

DR. TRACY B. MALLORY: It means the variation from the larger cells to the smaller cells. I do not think this is much above the average.

DR. FREMONT-SMITH: There is nothing else in the smear that might be significant? Because there might be abnormal cells there and the fifty per cent polymorphonuclears accounts for only half the cells present.

The non-protein nitrogen is pretty near the normal.

The renal function was "less than five per cent in two hours;" so evidently he took back some of the phthalein that he had excreted!

There is evidence of a definite hypothyroidism, and undoubtedly he had thyroid on the wards, which brought his metabolism up to normal; our problem is to decide whether his myxedema is sufficient to explain all his symptoms. We have occasionally found in patients an extremely low metabolism without any evidence of myxedema whatever,—as low as -40, whether due to emotional factors or to glandular derangements other than thyroid I do not know. In any case low figures occur without any evidence of myxedema clinically, and such patients are not benefited in any striking way by thyroid therapy and can take large amounts of thyroid without symptoms, which the myxedema patients cannot do.

"P-R interval .25" I believe is about the upper limit of normal. I think .2 is about the upper limit; .25 is a little high. Moderate left axis deviation certainly can go with hypertension either present now or in the past. The partial block may be due to arteriosclerosis, as may the inverted T wave. On the other hand we have to bear in mind that he has a low metabolism and there are hearts which enlarge in myxedema and which resume normal size under thyroid. In a man of seventy-seven with undoubted arteriosclerosis of the coronaries one would give thyroid with great care, because attacks of angina pectoris have been brought on by thyroid, whether in myxedema patients I am not sure. But certainly with an elderly person we should give thyroid with care, with the possibility of anginal attacks in mind.

His chart shows that he must have had some infection, because on the third day his temperature went up to over 100° and then to 101° on the sixth day, and his pulse was not remarkably slow.

DR. GEORGE W. HOLMES: The films which we have here are taken over a period beginning in May and continuing to October. In the early films there is a definite increase in the size of the heart shadow, and the increase is almost wholly to the left in the region of the ventricle. There is a prominence of the aortic knob, and when we compare this with the oblique view we can see the whole outline of the aorta, as we often can in the arteriosclerotic, and there is no dilation.

In addition to the changes in the heart, general enlargement and left ventricular, we have obliteration of the costovertebral sinus on the right—probably pleurisy at some time—and some thickening of the hilus shadow, but nothing very definite in the lung.

DR. FREMONT-SMITH: What is that shadow in the upper part of the lung? Is that due to rotation?

DR. HOLMES: Yes.

DR. FREMONT-SMITH: It seems to be so constant in all the films.

DR. HOLMES: It is rotated in practically every film. There might be something there, but I think we have no proof of it.

Six days after the first examination the next film was taken. The heart is a little smaller but it is not a very striking change, and on the 29th, which would be ten days later, there was still very little change in the heart or in the appearance of the chest. But when we come down to the 4th of June there is a very definite change

in the size of the heart. There the heart, while it maintains the same general shape, is distinctly smaller. In October it is a very different looking heart, much smaller and changed in shape. Except for this it is practically a picture of an old man's heart. Such a decrease in the size of the heart is rather characteristic of myxedema under treatment. There are only a few other conditions which will produce any such striking change in the size of the heart. So this interpretation would be arteriosclerosis with hypertrophy of the left ventricle and changes in a myxedematous heart following thyroid.

DR. FREMONT-SMITH: The costovertebral angle has cleared up, so there may have been fluid there.

DR. HOLMES: Yes, that is an important point. He may have had a respiratory infection.

DR. FREMONT-SMITH: The cardiac factor and one of the major general factors have been eliminated by thyroid. There is another factor not amenable to treatment with thyroid, the anemia. Is this still a pernicious anemia with cord changes, or is it possible to get cord changes in myxedema? I have never heard of it. So we shall have to look elsewhere. Although anemia does occur in myxedema—not very marked but some anemia—and that is one of the reasons why the myxedema is so often diagnosed as nephritis. The thick, palish face and the not unusual presence of albumin in the urine make a diagnosis of nephritis, if one is not on the lookout.

Of course that feeling in the epigastrium might be due to coronary thrombosis. It might, on the other hand, be due to an overdose of thyroid. You can have very severe pain and diarrhea from a surprisingly low dose of thyroid in myxedematous patients. It would have been very interesting to put him on thyroid for a month or six weeks without liver, and see what that did to his blood. But they gave him, quite rightly, thyroid and liver.

"There was dullness at the apices, with many fine and medium râles, more at the right front." That is an interesting finding. That sounds like tuberculosis. Dullness with râles at the apices is not where we should expect to find it with a failing heart; and yet we know that he did not have, two years before, pulmonary tuberculosis. Of course if those râles were all over the chest from base to apex, one could account for it by failing heart. If at one apex and one side of his chest, he might be developing pneumonia; but at both I do not know what the explanation is. A man of that age does not develop tuberculosis unless he has had it before. We often get it as a cause of death, more often than we are apt to think, but it does not begin at seventy-seven. There is consolidation, if these evidences are correct. I hope we shall have an x-ray later when he gets into the hospital.

"Index –20, angle 48, inverted T wave, high resistance." I do not know what those mean.

DR. MALLORY: I think the inverted T wave is common in myxedema.

DR. FREMONT-SMITH: These are all evidences, and perhaps those râles at the apex are also part of the evidence of chronic passive congestion and of failing heart. There is not much wrong with his kidneys. This is an old man plus a little infection of the bladder. The white cell count sounds like pneumonia.

Did this man have intestinal obstruction? The high non-protein nitrogen and the vomiting make that extremely likely, and in a man of this age I think one would think first, in the case of obstruction, of some vascular accident,—a thrombosis of the mesentery or a possible aneurysm of the aorta or one of the mesenteric vessels. Certainly the first would be the more likely of the two with this story. Did he have a failing heart and arteriosclerotic kidneys which were good enough to carry him along while his heart was compensated, and now kidney failure with high non-protein nitrogen and the vomiting of uremia? Or was there intestinal obstruction, vascular in type? I do not see how we can say. I think he had some infection, probably pneumonia, on top of the whole picture. Apparently angina was not caused by his thyroid medication. It would have been interesting to know whether he had been getting too much or too little. It would be interesting to know whether his heart failed and fibrillation began as a result of thyroid medication or whether it is simply the end of the story of a hypertensive heart.

DR. MALLORY: There are certain types of disease, most obviously for instance skin conditions, but also to a very great extent thyroid disease, where the diagnosis depends far more on what one can see and feel than on measurable chemical or physical determinations. Experienced eyes and fingers may make a diagnosis reflexly almost without cerebration. To transfer to a written page such impressions might tax the power of a Proust and is utterly beyond the capacity of the average man. Hence the man who has personally observed the case has an immense advantage over the one who must work from the written record.

I am going to ask Dr. Lerman, who has had the opportunity of examining this man repeatedly and of noting the changes from day to day under various therapeutic agents, to give us his impressions.

NOTE BY DR. JACOB LERMAN:* On his first entry this patient presented the typical picture of myxedema associated with arteriosclerosis in an old man. The initial medication consisted of thyroxin polypeptide, a product isolated by Harrington and Salter by digesting thyroid. Subsequently he received desiccated thyroid, three grains daily, and he was followed in the Thyroid Clinic.

*Research fellow in the Metabolism Laboratory and the Thyroid Clinic.

The changes that occurred in the heart under medication are of interest. On entrance the heart was enlarged and the sounds feeble. After three weeks of medication the transverse diameter of the heart had decreased 2.5 centimeters; at the end of five months it had decreased a total of 4.0 centimeters. The intensity of the heart sounds increased to normal. The blood pressure dropped from 145/90 to 125/70 five months later. The persistence of abnormal changes in the electrocardiogram in spite of thyroid medication indicated underlying coronary sclerosis. The cardiac findings in this case are typical of the "myxedema heart" which we are accustomed to see. Cardiac failure due to myxedema is rare.

The anemia of this patient was of secondary type. It did not respond to thyroid plus liver extract, but responded slowly to thyroid plus iron. From experience with other patients one can say that thyroid improves anemia in myxedema slowly over a period of months or not at all, whereas iron usually brings the blood to normal in short order.

After discharge from the hospital the patient was followed for a year and progressed satisfactorily. Then there was an interval of nine months during which he was not seen. On his return he showed unquestionable evidence of cardiac failure and auricular fibrillation which necessitated his second entry into the hospital. I believe that myxedema did not contribute to his death in any way.

CLINICAL DIAGNOSES (FROM HOSPITAL RECORD)

Arteriosclerotic heart disease.
Myxedema.
Pyelitis?
Mesenteric thrombosis?
Peritonitis.
Intestinal obstruction.
Paralytic ileus.

DR. MAURICE FREMONT-SMITH'S DIAGNOSES

Cardiosclerosis.
Myxedema.
Uremia?
Intestinal obstruction? (Mesenteric thrombosis?)

ANATOMIC DIAGNOSES

Thrombosis of the lower part of the superior mesenteric artery and its branches.
Gangrene of the small bowel.
Intestinal obstruction.
Generalized peritonitis.
Hydronephrosis, left.
Cystitis.
Slight arteriosclerosis, aortic and coronary.
Tumor (?) of the anterior pituitary.
Myxedema.
Cardiac hypertrophy and dilatation, hypertensive type.

PATHOLOGICAL DISCUSSION

DR. MALLORY: The autopsy showed a distinctly small, atrophic thyroid, weighing ten grams. The heart was very distinctly hypertrophied,—500 grams. There was a moderate amount of arteriosclerosis. The coronaries showed a few arteriosclerotic plaques but on the whole were in very good condition for his age.

A peculiar incidental finding was an adenoma, neither acidophile nor basophile, in the hypophysis.

The immediate cause of death was a thrombus of the superior mesenteric artery and gangrene of the gut. We found nothing in his lungs to account for the signs except acute congestion.

DR. FREMONT-SMITH: Isn't it rather unusual for a man to go into his seventies before he shows any myxedema, and then have an acute change? As I remember myxedema cases, many of them come to light in middle age, but this seems to me very old.

DR. MALLORY: Yes; I think this is the only case I have ever seen.

A STUDENT: Was there any examination of the marrow?

DR. MALLORY: It showed a fairly well marked hyperplasia, but nothing on which we could make a definite diagnosis of pernicious anemia. We examined the brain but we did not examine the cord, so I am afraid we shall never know about the spinal changes.

DR. FREMONT-SMITH: What is the story of diabetes and lack of thyroid as regards posterior tract changes?

DR. MALLORY: In two other cases of myxedema we have found degenerative changes in nerve cells, in one case in the motor cortex, in the other in the spinal cord, but no tract degenerations. In diabetes the changes are more apt to be in the peripheral nerves. They have been reported in the central nervous system, but Warren believes they are secondary to vascular lesions.

DR. FREMONT-SMITH: Do you happen to have any experience in regard to the relation between pernicious anemia and myxedema?

DR. MALLORY: You can get pernicious anemia with myxedema.

DR. FREMONT-SMITH: You think as a result?

DR. MALLORY: No, I do not believe there is any reason to suppose that it is causal.

CASE 19352

SYMMETRICAL PAINFUL LESIONS OF THE EXTREMITIES WITH HIGH BLOOD PRESSURE AND GANGRENE OF THE FINGER TIPS

Surgical and Medical Departments

Presentation of Case

Dr. Charles F. Warren:* *First admission.* A fifty-two year old white married native investment broker first came to this hospital four months before his final entry complaining of burning and cyanosis of the hands of about a year's duration.

Beginning a year before entry he noticed scaling, cyanosis and burning beginning in the right hand and soon spreading to his left hand, the burning finally extending to his right elbow and shoulder. Four or five months before entry he noticed difficulty in walking because of pain and also edema of the lower part of his legs. His hands became easily infected over this period of time and he lost several fingernails; and then a crack appeared on one of his left toes which became so painful that he was unable to walk.

The family history is negative. His parents lived to be over seventy years old.

The marital history is negative. He had two children living and well. His wife was well.

Past history. He had yellow fever and typhoid as a child in Florida, but otherwise had been well up to the present illness.

Physical examination showed pressure areas over both elbows. The finger tips were cyanotic, tender to touch, cold and slightly ulcerated. The toes showed similar but not such marked changes.

Laboratory notes at that time showed one specimen of urine with a specific gravity of 1.007; no albumin; sediment negative. A Wassermann test was negative. Blood studies were negative.

He was put in a warm box, raising the body temperature to 100° and the peripheral temperature to only 80°.

X-ray examination showed arteriosclerosis of the peripheral vessels.

It was decided to do alcohol injections of the first two dorsal roots on both sides to see if that would relieve his pain. This was done and he was discharged somewhat improved.

History of interval. After leaving the hospital he ran a gradual downhill course, with frontal headaches, worse in the evening, and some residual pain in the right arm. Three weeks after his discharge and eight weeks before his second admission he suddenly lost power of coördinated speech for a week and was unable to stand up. This gradually disappeared and he improved until two weeks before reëntry, when he became disoriented and had hallucinations. As he could not be controlled at home he was taken to the Psychopathic Hospital, where he stayed for six days before entry. The day before he came to the Massachusetts General Hospital he was allowed to go home, but fainted and was brought to the hospital in a confused mental state.

Second admission, eleven weeks after his previous discharge. At that time he looked pale, undernourished and older than his age, fifty-two. He was quite dehydrated and had considerable headache; he had vomited practically all the food he had eaten for five days; projectile vomiting as far as we could determine. The hands were dry, scaly, atrophic, and so hard that he was unable to extend his fingers. His feet showed similar changes, but not quite so marked. The tip of each finger showed a small area of gangrene. The heart was not enlarged to percussion. The sounds were of only fair quality, the aortic second sound being loud and snapping. The blood pressure was 218/100. The peripheral vessels showed moderate arteriosclerosis and the dorsalis pedis arteries were not palpable. The fundi showed sclerotic changes; the disk margins were slightly blurred. The reflexes were hypoactive.

The urine showed a slight trace of albumin and a low specific gravity, 1.006. The nonprotein nitrogen was 135 milligrams.

He remained in the ward for only four days, when the temperature suddenly rose to 103°, the pulse to 120, the respiration to 35, and he became comatose and died.

Clinical Discussion

Dr. Warren: At the first admission it was believed that his lesions were due to obliteration of the blood vessels and not to spasm.

The general impression of the case was that he had generalized arteriosclerosis and arteriolar sclerosis, probably affecting not only the peripheral vessels but the kidneys and brain.

Dr. Ronald T. Grant*: I should like to ask whether there was pulsation in the ulnar artery.

Dr. Warren: The ulnar was not so good as the radial, but both arteries were palpable.

Dr. Arthur W. Allen: This patient when he first presented himself at the Massachusetts General Hospital with symmetrical lesions of the upper extremities and more or less symmetrical lesions of the lower extremities presented a picture that was so closely allied to what we call Raynaud's disease or primary vasomotor imbalance that we felt that that diagnosis was justified. Almost immediately our studies began to refute this diagnosis; that is, in the first place his vessels showed a tremendous amount of calcification by x-ray; also we were unable to obtain any reasonable vasomotor response, that is, when his autonomic nervous system was obliterated by novocain there was only a very slight rise in peripheral surface temperature.

*Recently senior interne on the West Medical service.

*Associate of Sir Thomas Lewis at the University College Hospital Medical School, London.

He had so much pain in these ulcerated areas that we felt that we were justified in attempting to relieve it by some block of the sensory nerves. The difficulty is that if you block the sensory nerves in the hands you interfere tremendously with function, while in the lower extremity complete anesthesia can be obtained without such complications. This case is particularly rare. We seldom see gangrenous processes in the upper extremities due to arteriosclerosis. We see it so commonly in the lower extremities that one would hesitate I think in making a diagnosis of arteriosclerotic obliterative disease on an upper extremity lesion until one had definitely ruled out the possibility of spasm.

After a good deal of deliberation it was decided to block his right sympathetic ganglia with alcohol. On one attempt that Dr. Faxon made, after introducing the novocain he obtained anesthesia in the hand and did not introduce the alcohol because if he did he knew he would produce a peripheral neuritis. Three other attempts were made, but at no time was it possible to get alcohol into the ganglia in the cervicodorsal region without producing some numbness in the hand. A small amount of alcohol was finally introduced, however, which relieved the peripheral pain somewhat but at the same time gave him a neuritis in his shoulder and down his arm which interfered with the progress of treatment considerably. His ulcerative lesions on the feet and hands improved somewhat while he was in the hospital, but the hand lesions did not entirely heal. I think it is only fair to say that he had taken a great many drugs and a very large amount of alcohol in the past three or four months at any rate, and continued to do so after he was discharged from the hospital.

Dr. Aubrey O. Hampton: I cannot see the vessels of the hands in the x-ray films. The feet and ankles show extensive calcification. The hands show perhaps a slight amount in the radial artery on one side.

Dr. Tracy B. Mallory: I think I might anticipate by saying that although the leg vessels were extensively calcified we did not find any calcification in the radial arteries.

Dr. Allen: Both radial and ulnar arteries were pulsating and easily palpable at the first entry.

Dr. Henry H. Faxon: I think another thing of interest was the clinical evidence we had of the condition of his peripheral arteries. I satisfactorily blocked his cervical sympatheties with novocain with the result that he had a good rise in the surface temperature of his hands as far as the base of his fingers, but the ends of his fingers where he hoped for a definite rise showed essentially no change. In other words, there seemed to be a good deal of spasm in the larger vessels of his upper extremities but essentially none in the terminal arterioles.

Dr. Hampton: I should like to ask Dr. Holmes if he thinks the terminal phalanges are sharp or if they show any trophic changes in that hand.

Dr. George W. Holmes: I should think they were sharper than normal.

CLINICAL DIAGNOSES (FROM HOSPITAL RECORD)

Generalized arteriosclerosis.
Uremia.
Cerebral hemorrhage?

ANATOMIC DIAGNOSES

Arteriolar sclerosis, generalized.
Malignant vascular nephritis.
Gangrene of tip of right index finger.
Arteriosclerosis, moderate aortic, slight coronary.
Acute fibrinous pericarditis with effusion.
Hydrothorax, bilateral.
Healed pulmonary tuberculosis.
Chronic fibrous pleuritis, bilateral.
Cholesterosis.
Perineural overgrowth.
Degeneration of the right ulnar nerve.
Questionable spinal arachnoid hemorrhage.
Bronchopneumonia.

PATHOLOGIC DISCUSSION

Dr. Mallory: The peripheral circulatory manifestations in this man had focused attention so sharply upon his extremities that the final episode came as more or less of a surprise. When he came in the second time he was disoriented, very nearly comatose, with a non-protein nitrogen which you remember was up to 135, and he died obviously, as postmortem proved, of malignant vascular nephritis.

His kidneys, although not very much shrunken, were scarred with a combination of coarse and fine scarring. Even the gross appearance was quite diagnostic and microscopic examination leaves no question.

The vessels in the arms are of considerable interest. I will show you sections of them.

The first section is from the kidney. Those deep reddish-black areas are the small acutely necrotic thrombosed arterioles. The process is very extensive and uniform throughout the entire kidney substance.

This vessel is the radial artery. There is a trace of intimal thickening along the lower corner. There is no calcification in the media, no reduplication of the intima. Essentially at this particular level it is a normal artery for a man of fifty. Another section of the same artery at a different level shows very slightly more intimal thickening, but again very little change considering his age. In contrast, when we reach the fingertips we find very definite lesions. Here are three small vessels all showing very marked thickening of practically all the layers. In one the lumen is reduced to perhaps one-fifth of the

normal diameter. On the edge of the section you can see an almost completely obliterated artery. Here is the main digital artery with the lumen reduced to perhaps one-tenth of normal. It is still barely patent, but with a very marked degree of intimal thickening. So we find endarteritis of all the minute vessels of the finger tips, obviously explaining the location of the gangrene. What the cause is I am not prepared to say, though Buerger's disease can be definitely excluded, histologically as well as clinically.

Have you happened to see a combination of this sort before, Dr. Grant? What seems to be a primarily malignant vascular hypertension associated with gangrene of the finger tips?

DR. GRANT: I have never seen a case just like this. Occasionally one gets cases localized to the vessels of the fingers, but no generalized cases.

DR. MALLORY: Of course gangrene can occur in the fingers and toes as a result of circulatory failure, and it is not impossible that thrombi may have resulted in this case from such a cause, but there is very little in the history to suggest that.

DR. ALLEN: We are still not able to classify this case. I hoped that Dr. Grant was going to tell us that this bore out Sir Thomas Lewis's ideas of Raynaud's disease with the obliteration of the digital vessels. This is, I believe, the nearest approach to Lewis's type of Raynaud's disease that we have seen in our clinic. Just what process has produced this obliteration of the small vessels I do not know. I assume that it is a border-line condition of the two processes which we cannot explain or classify.

DR. MALLORY: The lesions in those small vessels would fit perfectly with thrombosis and reorganization just as well as or even better than with a straight arteriosclerotic process.

DR. GRANT: Was the heart examined as well as the kidney?

DR. MALLORY: With the exception of the fingers the extent of involvement of the arterioles in the various organs corresponded with that ordinarily found in cases of malignant vascular nephritis. The lesions were most marked in the kidney and spleen, distinctly less so in the pancreas and liver; there were practically none in the heart or in the lungs. Sections from the skin and the skeletal muscles and other regions showed no changes.

A PHYSICIAN: Have you examined the digital vessels in other cases of malignant hypertension?

DR. MALLORY: No; the digital vessels are something we very rarely get a chance to look at. That is one thing on which the undertakers' restrictions have to be considered particularly seriously.

DR. BERNARD M. JACOBSON: I think that the papilledema is something which is very significant for the diagnosis of malignant hypertension in contrast to benign hypertension.

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POSTGRADUATE MEDICAL EDUCATION FOR MASSACHUSETTS DOCTORS

THE Massachusetts Medical Society has recognized that medical practice in some particulars does not stand on the same plane with medical knowledge and that the profession must make all possible efforts to bridge the gaps. Although it is true that the majority of illnesses do not call for expert treatment and only require careful watching and amelioration of their discomforts, there are thousands in the minority group who need the best that medicine affords. From the inadequate treatment of this minority come unnecessary mortality and morbidity, discredit of the profession and suits for malpractice.

While the underlying motive in providing better training for physicians is the advantage to the patient, the practitioner profits materially and that is no small factor in the medical field, for the well-equipped and prosperous doctor enhances the dignity of the profession and promotes the confidence of the public. To the indiscriminating laity the weak links in the medical chain represent the quality of the whole, and such elements in the public must be led to appreciate the importance of scientific medicine. To bring this about, there must be no just ground for criticism of physicians.

Unfortunately there are practitioners who have not had the advantages of good training and such are likely to be unappreciative of opportunities for improvement, but the Society is confident that a large proportion of its Fellows are desirous of acquiring more knowledge. Acting under this conviction, a committee has been selected to prepare a curriculum of postgraduate education as has been previously announced in this *Journal* and within the past few days full information has been mailed to every resident Fellow.

This is set forth in an extension course of study in each of the eighteen districts and warrants careful examination because an effort has been made to cover every important field of practice. The reaction to this literature will determine the composite attitude of the members of the Society.

This is without question one of the most important activities ever launched by the Society and the response should be general and wellnigh immediate. If otherwise, it will be a reflection on the membership.

Every exercise will be conducted by men eminently qualified to present the latest knowledge respecting the several departments. The fees are small in comparison with the quality of instruction and all who are not experts in the several fields will profit by attendance on these courses.

The Committee is dedicated to the work and will carry it forward so far as the attendance of the doctors indicates their approval of the plans.

Study the curriculum, decide which courses to take, sign the postal card and forward it early so that arrangements may be completed.

MILITARY MEDICAL TRAINING

ATTENTION is called to the announcement of Col. G. A. Skinner, the Surgeon of the Seventh Corps Area of the U. S. War Department on page 463 of this issue.

There are two important reasons why the younger members of the medical profession should avail themselves of this training. First, because the Nation needs physicians who may be available in time of war and secondly, this course of instruction will be of advantage to practitioners.

Unfortunately enduring peace among the nations of this planet, however desirable, is not assured and if this country should again be compelled to take upon itself the responsibility of war, large numbers of well-qualified doctors will be needed because medical service is essential

and the practice of civil medicine does not prepare the average doctor to take his proper place in military organizations. Even the short course will to some extent prepare doctors for the technical training of the army or navy surgeon and in any general entanglement the medical profession will have to contribute many of its members.

A considerable proportion of the older World War surgeons will have passed the acceptable ages and the thousands who have since entered upon practice will be expected to enter service. They should be qualified so far as possible without having to learn the fundamentals of military surgery.

THIS WEEK'S ISSUE

CONTAINS articles by the following named authors:

SCHMIDT, WILLIAM H. M.D. University of Pennsylvania 1908. Associate in Physical Therapy, Jefferson Medical College. Director of the Department of Physical Therapy, Curtis Clinic, Jefferson Hospital. Director of the Department of Roentgenology, St. Mary's Hospital, Philadelphia. His subject is "Fever Therapy and Other Recent Developments in Physical Therapy." Page 419. Address: Medical Arts Bldg., Philadelphia, Pennsylvania.

PANCOAST, HENRY K. M.D. University of Pennsylvania School of Medicine 1898. Professor of Radiology, University of Pennsylvania and Graduate School of Medicine, University of Pennsylvania. Radiologist, University of Pennsylvania Hospital. Address: 3400 Spruce Street, Philadelphia, Pennsylvania. Associated with him is

PENDERGRASS, EUGENE P. M.D. University of Pennsylvania School of Medicine 1918. Assistant Professor of Radiology, University of Pennsylvania and Graduate School of Medicine, University of Pennsylvania. Associate Radiologist, Hospital of the University of Pennsylvania. Address: 3400 Spruce Street, Philadelphia, Pennsylvania. Their subject is "Pneumoconiosis: The Importance of Accuracy in Roentgenological Interpretation." Page 425.

STIVERS, GEORGE L. M.D. Long Island College of Medicine 1899. Medical Director, Belmont Hospital, Worcester, Mass. His subject is "The Use of Surgical Diathermy (or Endothermy) in Separating Pleural Adhesions in Cases of Pulmonary Tuberculosis." Page 437. Address: Belmont Hospital, Worcester, Massachusetts.

BOCK, A. V. A.B., Ph.D., M.D. Harvard University School of Medicine 1915. Physician, Massachusetts General Hospital. Associate Professor of Medicine, Harvard Medical School. Address: Massachusetts General Hospital, Boston. Associated with him is

DILL, D. B. B.S., M.A., Ph.D. Stanford University, 1925. Chemist, U. S. Department of Agriculture, 1917-1923. Assistant Professor of Biological Chemistry, Harvard 1927-. Address: Fatigue Laboratory, Morgan Hall, Soldiers Field Station, Boston. Their subject is "A Résumé of Some Physiological Reactions to High External Temperature." Page 442.

CHRISTIAN, HENRY A. A.M., LL.D., Sc.D., M.D. Johns Hopkins University School of Medicine 1900. Hersey Professor of the Theory and Practice of Physic, Harvard University. Physician-in-Chief, Peter Bent Brigham Hospital. His subject is "Some Undesirable Tendencies in Using an Etiological Classification of Heart Disease." Page 444. Address: Peter Bent Brigham Hospital, Boston.

CONNERY, JOSEPH E. M.D. University and Bellevue Hospital Medical College 1914. Associate Professor of Clinical Pathology, University and Bellevue Hospital Medical College, New York University. Visiting Physician, Third (New York University) Medical Division, Bellevue Hospital. Address: 75 E. 55th Street, New York City. Associated with him is

GOLDWATER, LEONARD J. A.B., M.D. University and Bellevue Hospital Medical College 1928. Instructor in Medicine, University and Bellevue Hospital Medical College, New York University. Clinical Assistant Visiting Physician, Third (New York University) Medical Division, Bellevue Hospital. Address: 141 W. 121st Street, New York City. Their subject is "Pernicious Anemia: A Conditioned Deficiency. Observations on the Effects of the Administration of a Substance Rich in Vitamin B Complex." Page 446.

BOWMAN, KARL M. A.B., M.D. University of California 1913. Chief Medical Officer, Boston Psychopathic Hospital 1921-. Assistant Professor of Psychiatry, Harvard Medical School. Assistant Professor of Clinical Psychiatry, Boston University School of Medicine. Head of Department of Psychiatric Social Work, Simmons College School of Social Work. His subject is "Progress in Psychiatry for 1932." Page 451. Address: 74 Fenwood Road, Boston.

MISCELLANY

MILITARY MEDICAL TRAINING

The medico-military course of inactive duty training for Medical Department Reserve officers, which has been held at the Mayo Clinic during the past four years, will again be held this year from October 1 to 14, both dates, inclusive. This inactive

duty training will follow the plan so well worked out under the auspices of Colonel George A. Skinner and the military features will be under his personal supervision.

This type of military medical training is now well established and has proved its worth during the past four years. The course offers valuable and interesting training for the Medical Department officers of all the components of our national defense. The staff and faculty of the Mayo Clinic have again placed their unexcelled facilities at the service of their government in the interest of preparedness, and have extended an invitation to all the services to participate.

This short course is equally applicable to general practitioners and specialists. The morning hours are devoted to purely professional subjects selected by the student officers. The afternoon hours pertain solely to medico-military subjects and the evening hours are covered in a lyceum course of general interest.

Application for this course of inactive duty training should be made to the Corps Area Surgeon, Seventh Corps Area, Omaha, Nebraska. Applications should state the character of the work that the candidate desires to follow in the morning hours. All student officers are expected to attend and participate in the afternoon and evening sessions. Each applicant should fully understand that the invitation to accept this course of study without charge is extended by the Mayo Clinic; that the project is without expense to the Government; and that one hundred hours' credit will be given those who take and complete the course. While it is desirable to attend the entire course, those whose time will not permit this may join or leave at any time and will receive credit for the hours spent in training. Uniforms are optional.—*Bulletin of the War Department*, Headquarters Seventh Corps Area, Office of the Surgeon, Baird Building, Omaha, Nebraska.

A RADIO MESSAGE PREPARED AND SPONSORED BY THE COMMITTEE ON PUBLIC EDUCATION OF THE MASSACHUSETTS MEDICAL SOCIETY FOR THE DEPARTMENT OF PUBLIC HEALTH

Social Service in Public Health*

BY ELEANOR E. KELLY

Those of you who have been listening in to this series of broadcasts have heard discussed some of the activities of workers in Public Health. History is full of the dramas of discovery and adventure in this field, and present-day records are constant witness to the less picturesque but equally vital activities. Today I want to interest you in medical social work and its relation to Public Health.

Public health efforts are still directed toward control of disease and promotion of health, but with ever-increasing emphasis on the promotion of health.

Maternal and infant hygiene, communicable disease, and certain other controllable diseases, in which education of the public and direction as to resources are of vital importance, are among the many concerns of Public Health Departments.

The doctor, the nurse and the laboratory technician are all recognized as essential in public health work, and daily we see evidence of the value of their services.

More and more, however, certain aspects of public health are becoming the concern of the public, and individuals and lay groups are taking hold, especially of the educational work.

Now this other co-worker who has been brought by the doctor into the field is the person of whom I want to speak particularly today, the trained medical social worker.

Medical social service is increasingly in demand in hospitals throughout the country, and undeniably has also a very real contribution to make to the effectiveness of a public health program. The keynote of social service in public health is individualization, that is, making the program meet the needs of the individual.

It has been seen for instance in the relief measures of today that it is not enough for a city or town to make available a large sum of money for great numbers of persons in need. The money must be given to individuals or families in accordance with the *particular* need and situation. A sum of money divided equally among a given number of persons would meet the need of each only in varying degrees.

Just so in public health. The information given and resources provided for the public must be made available to the individual, and effective in serving him.

Take for instance the State-aided Cancer Clinics in Massachusetts, established for the purpose of shortening the period of delay before treatment is secured by patients having cancer. These clinics are diagnostic only; an individual may come there to find out whether he has cancer, but he must go elsewhere for treatment.

Out of twenty patients coming for examination, five may be told they have cancer and need treatment, that of surgery or radiation. Of those five patients, one may accept the diagnosis and be able to make her own plans. Another may decide for herself, in spite of the doctor's careful explanation, that delay is a matter of less importance than a vacation trip she has planned. A third may agree to secure immediate treatment, but fail to do so because he cannot afford to take time from his job. A fourth will be unable to leave her children during the necessary three or four weeks of hospitalization. The fifth will be a bundle of fears, including fear of operation, of disfigurement, etc.

In only one case is the doctor reasonably cer-

*June 27, 1933, Station WBZ, 4:30 P.M.

tain that his recommendations will be carried out. Here then, is where the social worker is called upon to individualize.

The patient who does not fear delay may be persuaded after one or two visits by the social worker to her home, or she may be willing to allow the social worker to talk with another member of her family, who perhaps will influence the patient to follow the doctor's advice, even though it means disappointment in not having the long-planned trip.

The man who fears the loss of his job may be persuaded that it is better to risk his job, serious though its loss would be, while there is a reasonable certainty of cure, than to delay treatment until too late, thus risking his chance to provide for his family for years to come, and if he is willing, the social worker may be able, by explaining the urgency of his medical need, to secure from the employer a promise that his job will be held.

Obviously a woman cannot leave young children at home uncared for while she stays at the hospital, but if there is no relative or friend, a family caring agency or a children's agency can help her to make a plan for their care during her absence. The medical social worker will put the patient in touch with this agency and explain her need, thus helping her to secure the necessary treatment.

It is not easy to dispel fear, but patience and understanding on the part of the social worker may help the woman who is fearful to tap sources of courage not apparent at first and lead her to accept the doctor's plan.

The attitude of the patient and those interested in him is of great importance whether his condition is early and hopeful, or whether palliative treatment only can be given. Relatives and friends often fear contagion, and the social worker has an opportunity to correct this and other wrong ideas which might otherwise cause hardship to the patient. Educational efforts are directed toward recognition of the fact that cancer is *not* necessarily hopeless. If discovered early and treated promptly it may often be completely cured. The medical social worker shares the responsibility for spreading this knowledge.

In syphilis and gonorrhea there is presented the necessity not only for getting the patient under treatment, but also for persuading him to see that the source of infection is placed under treatment and that contacts are examined. No small degree of understanding and tact is necessary on the part of the social worker to meet the problems involved in accomplishing these ends. The social worker must, of course, as in all medical social problems, have sufficient knowledge of these diseases and forms of treatment to be a convincing ally to the doctor.

While the tuberculosis rate has decreased enormously, this disease is still sufficiently prevalent to be of great concern to public health departments.

Prompt and adequate treatment of an individual with tuberculosis means not only his chance for cure but also a safeguard for others in daily contact with him. Numerous social problems are presented where there is tuberculosis, for the necessity for long time inactivity is disrupting to work and home life, and almost always means a difficult period of mental adjustment. The social worker tries to help the patient to make plans so that he can accept the needed treatment and not have his recovery retarded by worry.

It is of the utmost importance that children showing early signs of tuberculosis be treated in order to prevent development of adult tuberculosis. Parents do not always recognize this fact because the children "seem well". Sometimes they are needed at home, or there is reluctance to allow a child to go away where he or she "may be homesick". These and many other barriers must be broken down in many individual cases before the program for control of childhood tuberculosis can be completely effective. Even then much effort may be lost if children are given expensive sanatorium care, then returned to an unsuitable environment in which the necessity for adequate food, rest and fresh air is not recognized, or in which these things are impossible of attainment.

Here the social worker considers with the family, the doctor, and the public health nurse, ways of improving the home conditions, or otherwise planning suitable care for the children, and attempts to see that their need is adequately met.

In these days of economic stress, the bare necessities of life are frequently not within reach of families most in need of them in abundance, and the medical social worker's problem is thus made much more difficult.

The public health social worker must always be familiar with resources both medical and social, for the person concerned about his health may delay unduly if he does not know where to turn, and may be bewildered by an array of resources which he does not know how to use.

Now the social worker is called upon far more frequently to interpret resources, for persons who have never been in need before are seeking help with medical, social and financial problems. And there is a somewhat different psychology in the present situation into which fear has crept and the sense of security has often been lost.

Health protection and medical care, unless urgent, are often the first things to be omitted from the budget when economy becomes necessary. Eyes may be strained because glasses are too expensive. Dangerous symptoms of disease may be ignored because the individual fears the cost of a physical examination and possible medical care. Or a child may be undernourished because the mother does not understand how to reduce food costs and still provide the essentials for health.

Frequently the ingenuity of the social worker is taxed to the utmost, especially in these days, when both public and private agencies are obliged to curtail their work through lack of funds.

There is danger of lowered standards in health as in other things. Health departments, public and private, medical and social agencies are faced with the problem of upholding standards and providing adequate resources; and there is a greater challenge than ever to the social worker in public health to bring together effectively the individual and the resources provided for him.

COMPARISON OF DISEASE INCIDENCE IN CONNECTICUT WITH 1932 AND SEVEN YEAR AVERAGE

MONTH ENDING AUGUST 19, 1933

Diseases	1933 Week ending July 29	1933 Week ending Aug. 5	1933 Week ending Aug. 12	1933 Week ending Aug. 19	Average cases reported for week corresponding to Aug. 19 for past seven years	1932 Week ending July 30	1932 Week ending Aug. 6	1932 Week ending Aug. 13	1932 Week ending Aug. 20
Actinomycosis	—	—	—	—	—	—	—	1	1
Cerebrospinal Men.	—	—	—	—	—	—	1	1	—
Chicken Pox	26	9	7	14	4	29	18	10	6
Conjunctivitis Inf.	—	—	1	—	—	—	7	—	—
Diphtheria	4	3	2	1	7	3	4	4	4
Dysentery Bacillary	—	1	—	—	—	—	—	—	—
Encephalitis Epid.	—	1	1	—	—	—	—	—	1
Favus	—	—	—	—	—	—	—	—	2
German Measles	2	—	1	—	1	1	1	—	—
Influenza	2	4	3	1	2	1	—	—	—
Malaria	—	—	1	—	—	—	—	—	—
Measles	22	25	10	9	12	34	26	14	17
Mumps	15	12	4	4	5	5	6	6	9
Paratyphoid Fever	—	—	1	—	—	—	—	—	—
Pneumonia (Broncho)	6	15	2	6	5	6	9	4	4
Pneumonia (Lobar)	9	9	8	9	9	21	5	6	7
Poliomyelitis	2	—	2	4	5	—	—	—	2
Rabies in Humans	—	—	—	—	—	—	1	—	—
Scarlet Fever	14	13	12	12	27	19	9	11	17
Septic Sore Throat	1	1	—	1	6	1	—	—	2
Tetanus	—	—	—	1	—	—	—	—	—
Trachoma	—	—	—	1	—	—	—	1	—
Tuberculosis (Pul.)	27	24	24	24	26	31	29	15	28
Tuberculosis (O. F.)	3	—	2	4	3	3	2	2	3
Typhoid Fever	2	3	3	2	4	1	2	4	4
Undulant Fever	—	—	—	3	—	1	1	2	—
Whooping Cough	52	20	34	21	41	119	66	64	79
Gonorrhea	21	13	65	38	32	50	25	15	34
Syphilis	46	25	31	33	35	35	32	21	22

Remarks: No cases of Asiatic cholera, glanders, plague, or yellow fever during the past seven years.

A STUDY OF SLEEPING SICKNESS

The Public Health Service has sent Dr. Charles Armstrong to St. Louis to aid Dr. J. P. Leake in studies of sleeping sickness which has caused a dozen deaths in that community. Dr. Armstrong has studied encephalitis at the National Institute of Health at Washington.

Surgeon General Cumming is expected to join the others at St. Louis.

A SAVING BY THE NEW YORK CITY DIPHTHERIA CAMPAIGN

Commissioner Wynne of New York City shows that the Health Department diphtheria campaign will save the taxpayers of the city $113,000 this year.

This estimated reduction is based on the days of hospitalization of diphtheria patients this year which seem to promise an expenditure of only

$65,000, $113,000 less than the average expense during the last three years. In addition to this there is a large saving to the families of the afflicted children. Thus public health demonstrates its economic value.

The Massachusetts Medical Society

COMPLICATIONS ARISING FROM INTERVIEWS WITH NEWSPAPER REPORTERS

Boston, Mass.,
August 21, 1933.

To the Editor,
New England Journal of Medicine,
Dear Mr. Editor:

The letter from Dr. Frank H. Lahey which this note accompanies, illustrates the unenviable situation in which physicians may find themselves if they trust in the discretion of reporters of the lay press. There could be, of course, no ethical objection to the giving by Dr. Lahey of an interview on the "Costs of Medical Care,"—a subject of wide interest in the field of social economics, but the reporter, after the manner of his kind, adorned his "write-up" in the *Boston Sunday Post* of May 28, 1933, with laudatory encomiums on Dr. Lahey and the work of his clinic which were offensive alike to canons of good taste and of professional ethics, and aroused criticism among his medical colleagues. As Dr. Lahey states, he tried to prevent such an event by cautioning the reporter and asking that the copy be submitted to him before publication;—this was not done, with the usual result. The moral is obvious: physicians who write or permit themselves to be quoted in the lay press, should insist on seeing the proof prior to publication.

Yours truly,

DAVID CHEEVER, *Chairman,*
Committee on Ethics and Discipline,
Massachusetts Medical Society.

Lahey Clinic
605 Commonwealth Avenue
Boston

August 23, 1933.

Managing Editor,
The *New England Journal of Medicine,*

The following is a letter which I would like to have you publish in the *Journal:*

"There recently appeared in the Sunday issue of the *Boston Post* a report of an interview with me by a special writer of that paper.

"I have requested that this letter be published in the *Journal* in order that my friends and associates in New England medicine may understand the circumstances under which the interview was given and the precautions taken by me to try and not violate the ethical standards of our profession. I am also prompted to write this letter, after talking with the Committee on Ethics of the Massachusetts Medical Society, because I wish to be helpful to them in trying to maintain the standard of ethical relationship between medicine and the public on as high a plane as possible.

"Some weeks ago a reporter from the *Post,* through my secretary, requested an interview with me on the cost of medical care. He stated that he was led to request an interview with me because he had obtained and read my presidential address before the New England Surgical Association in Hartford, 'Some Remarks on Medical Economics.' From this address there appeared several quotations in the article in the *Sunday Post.* I refused on two occasions to see him but on his insistence that the costs of medical care was a matter in which the public had rights, I telephoned Dr. Robert DeNormandie of the Committee on Ethics of the Massachusetts Medical Society, told him the situation, and asked him what I should do about it. He suggested that I talk with Dr. David Cheever, the Chairman of the Committee on Ethics. I proposed that he talk with Dr. Cheever, that they settle what I should do, telephone me their decision, and I would be governed by it. Dr. DeNormandie did this and telephoned me that the public was interested, that I had had the opportunity to see contract practice functioning on the Pacific Coast during the past winter, that he knew my views on the matter, and that I should give the reporter the interview and give him my opinions.

"I, therefore, talked with the reporter, answering his questions as to my views on some of the plans and proposals as to the costs of medical care and requested, as suggested by Dr. DeNormandie, that the article be submitted to me for criticism before publication (the reporter would not promise to do this), that my picture not be used if they had one, and that nothing concerning myself and the Clinic appear in the article. I explained to the reporter that I had talked with two members of the Committee on Ethics of the Massachusetts Medical Society, was seeing him on their opinion that it was proper for me to do it, and refused to discuss myself or the Clinic in reply to interrogations from him on those points. The reporter was good enough to say in the article that I refused to discuss these points but did not adhere strictly to my request not to discuss me or the Clinic, inserting several statements also regarding the costs of medical care and medicine in general, which were his views and not mine."

With kind regards,

FRANK H. LAHEY.

CORRESPONDENCE

A CRITICISM OF THE AUTOMOBILE LEGAL ASSOCIATION

Editor, *New England Journal of Medicine,*

Will you kindly permit me to relate my recent experience with the Automobile Legal Association,

as it will undoubtedly be of interest to other physicians.

For years I have been a member of the A. L. A., to which I cheerfully paid the annual dues as a protection against possible trouble in connection with my automobile.

Until this last year, I am sure, the company lost hardly any money on me, as I was fortunate enough to need their services only rarely.

It was different this year. I had trouble frequently in starting my machine and many a time I had to be towed in, until the mechanic discovered a few missing teeth in the flywheel. A new flywheel ended my trouble, and for the last few months I have had no other motor trouble.

Meanwhile the date of expiration of insurance with the A. L. A. was approaching and the usual advance bill for dues was not forthcoming. I began to suspect that owing to the mishap, I had become an unprofitable, hence, an undesirable client, and these suspicions were corroborated, when I called up the company.

Now, it is my contention that I did not get the fair treatment from the A. L. A. to which I was entitled. It was hardly fair to drop me, because in one year they may have been called upon to spend somewhat more on me than my dues amounted to, while in previous years they pocketed my dues, hardly being called upon to give any service.

This may be a good business method, but certainly it is not fair insurance.

Yours truly,

M. J. KONIKOW, M.D.

440 Warren Street,
Roxbury, Mass.

A LETTER TO PHYSICIANS AND DENTISTS

The Mayflower
Washington, D. C.
Mr. R. L. Pollio, Manager

August 1, 1933.

Dear Doctor:

This is a preliminary notice of a Microscopic, Oral Cavity, and Bone Diagnostic Demonstration with lantern slides, at the Mayflower Hotel, Washington, D. C., September 17 to 24, 1933, inclusive.

Thanks to the courtesy and interest of my friend, Mr. Pollio, Manager of the Mayflower Hotel, Washington, D. C., the following unusually low rates have been offered in order that you may attend the meeting at the lowest possible cost:

Single rooms with bath, $3.50 per person.

Large double room with twin beds and bath, $2.50 per person.

All rooms have bath, circulating ice water, electric fan and are outside rooms. These rates are practically fifty per cent below the normal rates.

Meals can be had in the Mayflower Coffee Shoppe as low as 40 cents for breakfast; 60 cents for luncheon and 85 cents and $1.00 for dinner.

We are changing from Baltimore to Washington because of the artificially cooled demonstration rooms given to us without cost, and also for the artificially cooled dining room and these especially low rates, with no change in the service of the hotel.

I am very anxious to attract to this demonstration in Washington, a large number of pathologists, radiologists, surgeons, dentists, and physicians interested in the diagnosis and treatment of cancer in all stages, and the local conditions that precede cancer. All the demonstrations will be diagnostic. Lantern slides will be shown first, and everyone will be given an opportunity to record their diagnosis before it is given. There will also be a discussion on pre- and postoperative irradiation.

It is essential for Mr. Pollio to know, as soon as possible, the number who expect to come. This demonstration cannot be given until 100 accept. The maximum to be accommodated in the cooled Ballroom which will be the demonstration room is 750.

Write Mr. Pollio immediately, registering for your days and accommodations desired. Please drop me a postal letting me know if you can come. It would be a great help to us if you would tell your colleagues, who may be interested in this meeting; give them the invitation and send me their names and addresses.

Anyone who wishes to present a case at any of the demonstrations should notify Dr. Charles F. Geschickter, Johns Hopkins Hospital, Baltimore, Md. All that is necessary is that the case must be put in lantern slides.

I would advise you to arrive, if possible, Sunday afternoon, September 17, as there will be a conference Sunday evening on the problem of preoperative irradiation. Monday will be devoted to the microscopic lantern slide demonstration, Tuesday, Wednesday, and Thursday to the regular bone demonstration, Friday and Saturday to the oral cavity demonstration.

The microscopic lantern slide demonstration will be chiefly a review of the sections in the loan collection and special relation to the biopsy of the breast, cervix, and lymph glands.

JOSEPH COLT BLOODGOOD.

3301 North Charles Street,
Baltimore, Md.

RECENT DEATH

ADAMS—JOHN P. ADAMS, M.D., of 704 Huntington Avenue, Boston, died suddenly at his home, August 21, 1933.

He was born in Ireland in 1863 and after at-

tending the Harvard Medical School for two years took the remainder of his medical courses at the University of Vermont Medical School from which he graduated in 1898. He was a member of the Staff of St. Elizabeth's Hospital.

He joined the Massachusetts Medical Society in 1898 and was also a member of the American Medical Association.

He belonged to the Charitable Irish and the St. Alphonsus Associations.

Dr. Adams is survived by his widow, Edith Adams, and a son, John P. Adams, Jr.

NOTICE

A CORRECTION

The statement in the daily papers that Dr. George R. Minot is a Dean of the School of Medicine and Dentistry of the University of Rochester, which was quoted in this *Journal*, is not correct.

SOCIETY MEETINGS, CONGRESSES AND CONFERENCES

September 11-15—The Twelfth Annual Scientific and Clinical Session of the American Congress of Physical Therapy will be held at the Palmer House, Chicago. Address the Executive Secretary, 30 North Michigan Avenue, Chicago.

September 13-14—Academy of Physical Medicine. Annual Meeting at the Palmer House, Chicago. Information may be obtained from the Secretary-Treasurer, Dr. Arthur H. Ring, 163 Hillside Avenue, Arlington, Mass.

September 16—The American Board of Otolaryngology will hold an examination in Boston just prior to the meeting of the American Academy of Ophthalmology and Otolaryngology. Prospective applicants for certificate should address the Secretary, Dr. W. P. Wherry, 1500 Medical Arts Building, Omaha, Nebraska.

September 17 to 24—Microscopic, Oral Cavity, and Bone Diagnostic Demonstration of Cancer, at the Mayflower Hotel, Washington, D. C.

September 19, 20, 21—The Connecticut Clinical Congress will meet at New Haven. Subjects for consideration: Diseases of the Blood, Diet in Disease, Industrial Injuries and Neuroses. Lectures, Demonstrations, Group Conferences.

September 25-30—The American Congress of Radiology will be held at the Palmer House, Chicago. For particulars write to Dr. Benjamin H. Orndoff, 2561 North Clark Street, Chicago.

September 29 and 30—New England Surgical Society at Boston.

October 9-12—The American Public Health Association will hold its sixty-second annual meeting at Indianapolis. For details on the scientific program write to the American Public Health Association, 450 Seventh Avenue, New York, N. Y.

October 9-13—The Clinical Congress of the American College of Surgeons will hold its twenty-third annual session at Chicago. Headquarters for the Congress will be at the Stevens Hotel.

October 13, 1933 - May 11, 1934—William Harvey Society. (Eight Lectures. Monthly.)

October 16, 17, 18—Massachusetts State Nurses' Association, Hotel Kimball, Springfield, Mass. For details write Helene G. Lee, R.N., 420 Boylston Street, Boston.

October 18—New England Physical Therapy Society. First Fall Meeting. Detailed announcement later. Dr. Arthur H. Ring, Secretary, 163 Hillside Avenue, Arlington, Mass.

October 23 - November 3—The 1933 Graduate Fortnight of the New York Academy of Medicine. The theme during the two weeks of intensive study will be Metabolic Disorders. A complete program may be obtained by writing Dr. Frederick P. Reynolds, The New York Academy of Medicine, 2 East 103rd Street, New York City.

October 25-30—International Congress on the Scientific and Social Contest Against Cancer will be held at Madrid. For information address Dr. Julio Bejarano, Atocha, 104. Madrid, Spain.

October 28—The American Board of Dermatology and Syphilology will hold written examinations for candidates in the following cities: New York City; St. Louis, Mo.; Boston, Mass.; Cleveland, Ohio; San Francisco, Calif.; Philadelphia, Pa.; Chicago, Ill. Information may be obtained from the Secretary, Dr. C. Guy Lane, 416 Marlborough Street, Boston, Mass.

December 15 and 16—The American Board of Dermatology and Syphilology will hold oral examinations in New York City. Information may be obtained from the Secretary, Dr. C. Guy Lane, 416 Marlborough Street, Boston, Mass.

April 16-20, 1934—The American College of Physicians will hold its Eighteenth Annual Clinical Session in Chicago at the Palmer House. For information write Mr. E. R. Loveland, Executive Secretary, 133-135 South 36th Street, Philadelphia, Pa.

July 24-31, 1934—The IVth International Congress of Radiology will be held in Zurich under the presidency of Professor H. R. Schnlz. General Secretary Dr. H. E. Walther, Gloriastrasse 14, Zurich.

BOOK REVIEWS

Senile Cataract, Methods of Operating. By W. A. FISHER, M.D. Published by the Chicago Eye, Ear, Nose and Throat College. 267 Pages.

This book is a compilation of various techniques and methods of operating on senile cataract employed by some of the prominent oculists here and abroad. There are chapters by E. Fuchs of Vienna, Barraquer of Barcelona, Holland of Shikarpur, India, Van Lint of Brussels, Wright of Columbus, Ohio, Nugent of Chicago, as well as by the author.

Extraction in the capsule has received the most attention. For this procedure Smith's method of expression and Barraquer's suction method, or modification of these, are given by far the most prominence. Minute details in preparation of the patient and the various steps in the operation are commendably stressed. Certainly the men whose views are expressed in this book may speak with authority. It must be remembered, however, that they are exceptionally skillful operators and might well succeed if they employed a different type of procedure than the one they advocate. Many oculists feel that the extraction with forceps is a safer and more easily learned method. It is probably more widely and successfully used in the United States than any other method, and, it seems to the reviewer, should be given more stress in a book of this sort. It is a book, however, well worth having for its store of useful information.

Psychoanalysis and Medicine: A Study of the Wish to Fall Ill. By KARIN STEPHEN, M.A. New York: The Macmillan Company, Cambridge, England: The University Press, 1933. 238 Pages. Price $2.50.

This book consists of a series of lectures delivered at Cambridge University, England, mainly to medical students, by Dr. Stephen, a well-trained woman physician, and a profound student of psychoanalysis. She has succeeded, in a comparatively brief presentation, in setting before the medical world a critical summary of this most difficult subject. The reviewer feels that this is one

of the soundest and clearest books yet written on the subject. The author considers the subconscious mechanisms which lead to functional disorders of the nervous system and points out frequently how moderate is our understanding of these complicated processes, even after fifteen or twenty years of intensive labor by many psychoanalysts in different parts of the world. A few things seem to be fixed, but nevertheless even these may become relatively unimportant as this experimental field is further explored. To any physician who wishes to read a reasonable account, free from excessive prejudice, about a subject in which rapid advance is being made almost daily, this book can be highly recommended.

Frontiers of Medicine. By MORRIS FISHBEIN, M.D. A Century of Progress Series. The Williams & Wilkins Co., Baltimore, 1933. x + 207 Pages. Price $1.00.

This account of medical history, compressed into two hundred pages, is an excellent, well-written review of the subject. The style is semi-popular, as is fitting, but the subject matter has been carefully gone into and the statements are authentic. The book is a fine example of what can be done to popularize the history of medicine, by an author who is entirely familiar with the subject and can present it to the public in an interesting manner. Sold at a very reasonable price, as one of the Century of Progress Series, the book serves a useful purpose and should be widely read.

Cancer and Other Chronic Diseases in Massachusetts. By GEORGE H. BIGELOW, M.D., Dr.P.H., and HERBERT L. LOMBARD, M.D., M.P.H. Houghton Mifflin Co., Boston and New York, 1933. 355 Pages. Price $4.00.

In this volume the authors have collected a vast amount of material which they have obtained over a period of several years. The first half deals with the problems of chronic disease, the incidence of chronic disease and its public health aspects. Conclusions arrived at are based on a vast number of tables occupying the second half of the book. Many of the data have been collected from the state-aided cancer clinics and the Pondville Hospital.

The authors are to be commended for the way they have tied together in one volume data on so many different aspects of the chronic disease problem. It is particularly gratifying that the book should be published at this time as it sums up the studies of the retiring Commissioner of Health during a very active public health service.

Outline of the Cranial Nerves. By JOHN FAVILL, A.B., M.D., F.A.C.P. Chicago: The University of Chicago Press. 1933.

In his foreword, the author states that his purpose in this monograph is not to present new material but to regroup and arrange the data about cranial nerves desired by the novice in neurology. "This outline is an attempt to present the necessary information in convenient form." Each nerve is considered under the five heads of anatomy, function, tests, pathology, and localization. The anatomy of sensory nerves is given from the periphery proximally, and that of motor nerves from the supranuclear supply distally. The nerves are not taken up numerically, but in the logical sequence one, two, three, four, six, eight, five, seven, nine, ten, eleven, twelve. The book is illustrated with fourteen excellent line-drawings. It should be a valuable adjuvant and adjunct for the teacher and student of anatomy as well as of neurology.

BOOKS RECEIVED FOR REVIEW

La Diathermie by Paul Duhem. Second Edition. Published by Gauthier-Villars. 147 Pages. Price 20 fr.

Teaching Methods in Medicine by William D. Reid. Published by The Graphic Press. 111 Pages. Price $1.00.

Proceedings of the First International Congress on Mental Hygiene. Edited by Frankwood E. Williams. Volume 1. 803 Pages. Volume 2. 840 Pages. Published by The International Committee for Mental Hygiene, Inc.

Essentials of Prescription Writing by Cary Eggleston. Fifth Edition. Published by W. B. Saunders Company. 155 Pages. Price $1.50.

What Shall I Eat? by Edith M. Barber. Published by The Macmillan Company. 106 Pages. Price $1.75.

Proceedings of Southern Branch American Public Health Association held at Birmingham, Alabama, November 14, 15, 16, 1932. Published by The American Public Health Association. 100 Pages. Price 50 cents.

The History and Epidemiology of Syphilis by William Allen Pusey. Published by Charles C. Thomas. 113 Pages. Price $2.00.

Pediatrics by Henry Dwight Chapin and Lawrence T. Royster. Seventh Edition. Published by William Wood & Company. 775 Pages. Price $7.00.

Migraine. Diagnosis and Treatment by Ray M. Balyeat. Published by J. B. Lippincott Company. 242 Pages. Price $3.00.

The Cyclopedia of Medicine. George Morris Piersol, Editor-in-Chief, and Edward L. Bortz, Assistant Editor. 7 Volumes. Published by F. A. Davis Company.

Röntgenatlas der Lungenerkrankungen by Dr. W. Brednow and E. Hofmann. Published by Urban & Schwarzenberg. 206 Pages.